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THE INVOLVEMENT OF NGOS IN THE DEVELOPMENT OF BUILDING MATERIALS INDUSTRY IN AFRICA **

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1. INTRODUCTION

From the outset, the market for building materials in Africa appears divided into two well-defined sectors.

The first is the so-called "modern" sector, which includes civil engineering works, administration buildings and blocks, offices, banks and shops of the European type, high and medium-standing housing, industrial plants and infrastructures, etc.

The second sector is that of housing for the bulk (90 per cent) of the urban population and for nearly all the rural inhabitants.

The different characteristics of these two sectors are sufficiently well known, and they have been so extensively studied that it is unnecessary to dwell on them at length here. It will suffice to recall the main elements that are relevant to our present study:

(1) Building materials peculiar to the modern sector have a higher value added per unit.

(2) Conversely, the materials needed to build housing for the majority of the people are bulky and have a low value added per unit (cement, sheet-iron, sand).

(3) With respect to investments, the industries of the modern sector which provide finishing materials and fittings differ from those engaged in structural construction because of their limited capital intensiveness, which corresponds to a strategy of short or medium-term depreciation.

(4) The two most important materials as regards Development, because they appear at all levels (infrastructure, industry, buildings) are cement and steel - the latter basically in the form of sheets for roofing. Their production requires heavy investments which cannot be written off in less than fifteen to twenty years.

These are, in our view, the factors which have determined the choice of investments during the past two decades.

The products in which industrialists have so far taken an interest are marked by the following features:

(1) A high incidence of transport costs.

The products are usually bulky and/or cumbersome. This is an important advantage when setting up a local industry.

(2) A moderate capital intensiveness

This factor is often decisive in the present context of shortage of investments. Its effect is all the more marked for "high risk" countries. New international investments in the past fifteen years have been marked by a distinct inclination to avoid long-term commitments, with an emphasis on immediate profitability. Moreover, the consequent reduction in the share of fixed costs makes for a better adaptation to the fluctuations in demand, which are of great magnitude.

(3) A high value added rate.

Investors tend to chose materials with a greater relative value added, with a view to ensuring profit margins wide enough to off-set the often irregular operation of the distribution networks.

(4) Adequacy for the markets of the modern sector. The main attraction of these markets is their solvency. There are other advantages, such as the security assured by the traditional distribution networks, the fact that the characteristics of the demand are better known, the convenience afforded by the ease of transfers of know-how or of equipment and the ready access to financing, in particular for suppliers of machine-tools and semi-finished products.

It was in this way that there developed in West Africa immediately after independence such industries as clinker grinding units, brickworks, tile-manufacturing, carpentry works, aluminium factories, etc.

The general strategy of import substitution focused on this modern sector, whose spectacular growth continued until the end of the 1960s. This is also the sector which has recently experienced one of the worst recessions.

This is one of the reasons for the partial failure of the strategy for the development of building materials, a strategy which banked primarily on the modern sector and relied on the fall-out on the peripheral sector (the more important one).

The other basic cause for that lack of success is connected with the failure to integrate the policy of large-scale investments in civil engineering works into a scheme for the setting up of a local production apparatus.

2. BUILDING MATERIALS IN AFRICA

2.1 Present and future demand.

Present-day Africa is marked by a very poor level of equipment and an exceptionally high birth rate in absolute figures whose effects are aggravated by existing difficulties in the agricultural and food sector (migration pressures) and by a very large rural exodus potential, due to the low urbanization rates prevailing at present.

The needs for equipments, infrastructures and housing are accordingly considerable and generate a demand which greatly exceeds the productive capacity of the African industrial apparatus. This demand centres on two main products: cement and steel.

To these may be added, in order of decreasing importance: wood, aggregates and sand, and petroleum by-products.

The main features of the production of these various elements will be examined below.

By way of general comments, it may be pointed out here that the problem of the inadequacy of resources to meet existing needs ought to be solved primarily by drawing inspiration from the strategy adopted by the developed countries when faced by the petroleum crisis. The problem in question can be effectively solved by the optimization of consumption by means of maximum utilization.

More precisely, it can be asserted, for example, that the improved utilization of cement will in due course have the effect of developing its production.

2.2 Resources and production apparatus

The production of building materials requires:

(1) financial resources;

(2) raw materials;

(3) energy resources;

(4) human resources;

(5) technical equipments;

(6) distribution networks.

It is worth while to examine, albeit cursorily, these various factors, confining ourselves however to the main products among those mentioned above.

(1) Financial resources

With regard to cement and steel, the initial investment required is of very great magnitude. Accordingly, cement works are few and African production of clinker is very much below existing needs.

Similarly, the steel industry has had a very limited development south of the Sahara, particularly since the share of transport costs is low - which means that the African steel industry has to face a strong international competition.

To this must be added the propensity of investors to seek investments that can be written off on a short-term basis - a thing which is compatible only with the production of wood derivates and of petroleum products. This is true also of the light metallurgical industry (conversion into semi-products).

The heavy metallurgical industry, on the other hand (i.e. rolling mills, plants for the processing of billets and semi-products) is more difficult to operate profitably and there have been a number of failures in this field.

More generally, the paucity of the industry's own financial resources has heavily penalised the major industrial plants processing products for which large-scale operation is a decisive factor in the manufacturing process (steel, clinker).

Large-scale production by industrial units has also an effect on the cost of transport infrastructure. An analysis, and a quantitative study, remain to be made of the costs and burdens resulting for the community, in the context of a comparative assessment of production structures which involve large-scale concentration and hence a heavy distribution network.

(2) Raw materials

Cement

With regard to cement, the necessary clay and limestone are usually available. It should, however, be noted that there are vast areas, in West Africa particularly, without any calcareous sedimentations, a fact which could inspire doubts regarding the choice of cement. This is the case with Ivory Coast where there are no limestone deposits suitable for clinker production, even in mini-cement works.

Steel

As for the iron and steel industy, iron ore deposits are not very widespread, although existing resources are sufficient to meet present demand (Liberia, Mauritania, Angola, Sierra-Leone, Guinea, Morocco, Egypt). Actually, iron ore is not the only problem with regard to the iron and steel industry; coal - converted into coke - must also be available.

Modern methods of handling and carriage by sea have brought down transport costs considerably; the steel market is accordingly highly integrated and competitive on a world-wide basis.

Steel production has accordingly lost the strategic importance which it previously had. The choice of location for it is now based more on the availability of good handling and transport facilities and the existence of a sufficiently well-structured local market (metallurgy of semi-finished and finished products).

Aggregates and sands

The cost and relative importance of these two materials vary considerably. These are products with a large share of local added value because production costs are limited to extraction, handling and transport operations, because they are bulky products and because their initial cost is low (extraction charges). It is of crucial importance to determine the optimum transportation distances. The ideal solution would be for extraction sites to be widely dispersed - a thing which is unfortunately not always the case.

Wood

The situation and prospects with regard to the wood industry vary considerably in Africa from one sub-region to another. While the tropical

belt of Africa may be considered as one of the most important potential producers of raw wood, other vast regions (Sahel, North Africa and southern Africa) are markedly deficient in wood resources. Inter-African integration of the wood industry therefore seems a priori highly recommendable. It should be recalled here that wood production in Africa is subdivided into three main branches: fuel wood, wood for building and wood manufacture (handicrafts, furniture, etc.). The promotion of wood for use in building, since it has a higher value added rate compared to the use of wood as fuel, should make it possible to carry out campaigns for the conservation and revitalization of forest resources and for reafforestation (hence the strategic importance of the so-called secondary, or rapid growth, tree species).

Petroleum by-products

Petroleum, and, more generally, hydrocarbons, are considered here not as energy products but as raw materials for the sector of industry producing plastics and other derivates (bitumens, resins, varnishes, paints, etc.).

Consumption for these purposes is much smaller (6 per cent) than that connected with energy production.

In addition, the high value added rates and the convenience of bulk transportation make for competitiveness and wide distribution of semi-products. The market for these products, like that of steel, is quite competitive and highly integrated on a world-wide basis. Here also, the target is the creation of a final conversion industry (piping, sanitary equipment, varnishes, paints, etc.).

(3) Energy resources

Energy costs are very high for the two basic materials: cement and steel. They are lower for the other materials (wood, hydrocarbon by-products). The energy content of aggregates and sands is moderate but varies considerably with the transport distances.

In all the cases considered, a strict husbandry of energy resources is imperative. Efforts must be focused on the optimisation of manufacturing processes, the accounting of physical costs for purposes of distribution and lastly - and chiefly - savings in materials with a high energy content (steel, cement).

The foregoing is particularly true for certain areas of Africa which are completely dependent on outside sources of energy, and in which the development of building industries could bring about a veritable haemorrage of foreign exchange.

(4) Human resources

The building trade is a great consumer of labour and is also largely dependent on the quality of its actors' know-how.

The building materials industry, on the other hand, is closer to heavy industry in its specific characteristics with regard to human resources. This is at least the case for large cement works and for the iron and steel industry. The position is different with regard to the wood industry, and to small and medium-sized metallurgical plants. Here, the needs for training are vital in a field where the challenges are greater and the products have a high value added rate.

The situation differs greatly from one country to another but the optimum levels required are rarely attained, in particular as regards technicians and executives.

This is a challenge of fundamental importance in which the intervention of a qualified NGO would be welcome.

(5) Technical equipments

Two criteria are of prime importance in this respect: size and sophistication. In other words, on the one hand the quantitative aspect, which is inter-related with financial, infrastructure and distribution problems, and, on the other hand, the qualitative aspect which harks back to the problem of human resources and to that of technology.

This leads us to recent discussions on the subject of adapted technologies, to studies on the effects of large-scale operation, and the problems of the transfer of technology and know-how.

We will deal with these various questions below by reference to the specific cases of the cement, metallurgy and wood industries.

(6) Distribution networks

Once the manufacturing process is completed, it is necessary to manage in the best possible manner the factors involved in ensuring that the products

reach the utilization stage. With regard to the physical aspect of distribution, the generally bulky and/or cumbersome nature of building materials must be borne in mind.

Production may be split up among many small units, in which case transport problems are transferred upstream to the supply stage; alternatively, production can be comparatively centralized in large units in order to benefit from the advantages of large-scale production, in which case there are even greater problems in the matter of financing and transport logistics.

Independently of the purely physical and technical aspect of distribution, there are at least equally important implications with regard to the financing of stocks, marketing and management.

Malfunctioning is frequent in distribution networks, which are sometimes ill-adapted to the real conditions of contemporary Africa. These networks are sometimes still rooted in the trading post tradition or, conversely, adhere exclusively to the organizational pattern of the monosectorial distribution chains peculiar to the commodity trade of the developed countries.

This latter trend was a viable and performing one so long as the building trade appeared as the veritable motor of growth but this is no longer the case in many countries.

It may well be that the setting up of well-adapted distribution networks represents a major challenge for the role of the NGOs in the development of the building materials industry and in making low-cost building materials available to the population.

3. THE NGOs IN THE BUILDING TRADE IN WEST AFRICA

3.1 Framework and direction of the study

Specialized publications contain numerous evaluations of the actions undertaken by the NGOs, especially in the field of low-cost housing and renewed urban tissues.

A systematic study still remains to be made, however, of the structures, objectives, financing and areas of operation - present and contemplated - of the NGOs active in Africa. It must also be added that there are only a few references to actions in the realm of the manufacture of building materials,

in Africa at least. It has, however, been possible to study the activities performed by the Association for the Development of an African Architecture and Town-Planning (ADAUA), in particular with regard to lime (small kilns) and plaster.

We have also undertaken a parallel series of discussions of a prospective character with a number of NGOs with a potential interest in building materials although active mainly - as most NGOs - in the fields of agriculture and training.

3.2 International financing and action of the NGOs

The undoubted (and growing) audience enjoyed by the NGOs is due in part to the support of international development assistance agencies which have found an answer to many of their problems by acting in partnership with them.

The actions undertaken - both multilaterally and bilaterally - by development assistance agencies are more often than not strictly financial in character. The control of the projects and the utilization of the funds is more often than not local, even though a more structured assistance can be furnished with regard to the assessment of needs, the conception of projects, the provision of executive staff, training, etc. This option is a fundamental one in the context of an international co-operation directed towards the enhancement of economic independence.

In this case, the natural partners are the various institutionalized technical and economic services. These services usually operate within an administrative pattern of thinking - sometimes an exacerbated one - which is hardly compatible with projects which are often marked by urgency or which comport elements of innovation.

Financial excess costs can reach high levels and technical or economic performance will then suffer considerably. Development financiers have accordingly adopted a dual approach:

(1) To support key institutionalized agencies by means of training assistance, the sending of experts and the supply of equipment.

(2) To use the NGOs on a provisional stop-gap basis, in the framework of a strategy focused on training and the promotion of appropriate industries.

The flexibility of operation of the NGOs and the certainty as to the motivation of their members, often mean that they can become instruments of development that are immediately operational. Their low operational costs, their mobility and their specialization constitute further attractions.

On the other hand, the action of the NGOs often runs into difficulties in the realm of structure-building. Counterpart problems connected with the projects are not always properly mastered. The NGOs suffer from the defects that correspond to their very qualities. Thus, their great mobility is off-set by less integration in the real factors of the operation of the autonomous economic agents.

3.3 The local institutionalized services and the NGOs

Relations between the two can sometimes be very tense because NGOs often enter an area, or remedy a gap (or alleged gap), in an institutionalized technical, administrative or economic service. Distrustful relations may ensue, which can only be remedied when the relevance of the action of the NGO is perceived, as well as its competence and its deliberate policy of promotion and training, without any thought of perpetuating its action.

In addition, the non-profit-making character of the objectives of NGOs makes it possible to overcome many hesitations.

3.4 Privileged fields of action

In a spirit of urgency, the main NGOs have focused on actions for the production of housing for the underprivileged.

These actions have taken place at two levels: directly at the level of execution and participation, and indirect actions, so to speak - i.e. actions concerned with technical training, assistance to self-building and setting up of co-operatives.

Subsequently and in the same logical process, efforts should be directed towards direct production, upstream in the building industry.

It can be observed that the action is directed more towards:

(1) The designing and promotion of alternative technologies which demand less imported tools and raw materials, involve more know-how; stabilized earth, plaster, etc.

(2) The adaptation of architecture, town planning and urban techniques to the African modes of life.

(3) The promotion of the production of intermediate commodities: lime, geocement presses, tools, etc.

Although the experience of certain NGOs (such as ADAUA and Volunteers for Progress) in the realm of building is impressive, their action as regards building materials is much more modest.

It operates with regard to the production of substitute binding materials to replace Portland cement.

Thus, a number of lime kilns have been developed which produce on a small scale lime that is of inferior quality but nonetheless adequate. Production costs, on the other hand, are quite high and the product is competitive only in areas sufficiently remote from the modern production circuits.

Moreover, these kilns use wood as fuel, so that if the technology were to develop, it would lead to problems in the countries of the Sahel.

To our knowledge there are no mini-cement works.

4. PROSPECTIVE ASSESSMENT AND PROPOSAL FOR ACTION

4.1 The production of building materials

We will not deal here with specific actions which may take place in one or other very particular sectors but which play only a marginal role with regard to building costs. Accordingly, in order to avoid diluting our account we will confine it to the main products: cement, steel, aggregates, wood and petroleum by-prodicts; we will also include intermediate products which account for the major part of employment: masonry blocks, roofing sheets, piping, etc.

(1) Cement

The cement industry proper comprises two distinct phases: the manufacture of clinkers (firing of the clay-limestone mixture) on the one hand, and the grinding and conditioning of the cement on the other, with the possible addition of slag, pozzolanas, filler, etc.

The first phase usually involves nowadays very large industrial investments, combined with the very sophisticated technologies indispensable

to guarantee the quality of products and the optimization of costs, in particular energy costs. The large cement plants have thus accomplished spectacular progress immediately after the petroleum crisis of the previous decade.

However, despite the performances of this industrial apparatus, the final cost of the product is too high bearing in mind the financial capacity of the bulk of potential users in Africa.

It must be noted here that cement, its production and its use, constitute decisive elements in all development strategies, at least in the foreseeable future.

Cement plays a part not only in the production of housing but also in the realm of infrastrucute, of large and small equipments and of industrial and agro-industrial plants.

Projects for the substitution of cement have for the time being remained essentially at the exploratory stage.

The policy followed by India and China appears more appropriate. It rests, among other things, on the promotion and manufacture of "low-grade cement".

This type of cement conforms to adjusted standards which are less strict and can be met at less cost by means of appropriate technologies and with smaller investments. More importantly, they demand less in the way of technology transfers from abroad.

These cements cannot cover the whole range of existing needs and it is still essential to import Portland cement to some extent. Nevertheless, they are well suited for a vast range of uses, housing in particular (except for large housing projects).

If we examine now the second phase of cement production, namely that ranging from grinding to conditioning, the question arises whether a restructuring of the industry may not be desirable in some cases, by breaking up and dispersing the grinding units.

This would make it possible, upstream, to take advantage of the difference between the transport costs for clinker and cement respectively.

Downstream, it would make distribution networks shorter, with, as a direct consequence, savings with respect to conditioning and would also have all the advantages connected with manufacture to order.

This option would of course necessitate accompanying actions by the NGOs in the field of training and in working out guiding and dosage techniques for small plants, and hence help to control problems of quality.

(2) Binding materials as a substitute for cement

The main product for consideration under this heading is lime. Modern technologies for its manufacture are very similar to those of cement. Prices in the international market are also not very different. Lime has the advantage at the beginning of the manufacturing process (low firing temperature, use of limestone exclusively). At the latter stages, however, the advantages connected with transport and storage of clinker are uppermost.

Accordingly, the price of industrially-produced lime becomes very high as soon as the distance of transport increases. This explains why in a great many countries of Africa small-scale production of lime persists and remains competitive, its main problems being quality and energy consumption.

It is therefore appropriate to try to promote, wherever possible, the passage from small-scale production (with its heavy consumption of wood as fuel) to semi-industrial production in mini straight kilns. This process has the advantage of being adapted to small-size limestone deposits, such as the faluns which are the only sources of limestone in many countries of West Africa.

There again, there is a considerable potential role for the NGOs to play in the optimization of the process, in training and in quality management. Actually, there is already activities in this direction. Mention can be made in this respect, for West Africa alone, of those undertaken by ADAUA in Senegal, Mauritania, Burkina-Fasso and Mali.

There are also interesting prospects regarding the re-use of this lime by a second firing in a home-made kiln, using as fuel agricultural wastes, such as rice hulks, which are rich in silicon; as a result, this by-product of home firing acquires the characteristics of hydraulic binding materials.

With regard to substitutes for cement, mention should be made of the experiments under way with plaster, gypsum and sulphur.

We enter here the realm of R + D (Research and Development) operations, for which the stakes are very high but whose action is less immediate - so that they do not come within the effective purview of NGO action in the traditional sense.

Governmental, para-Statal and private research agencies remain very active in this field. There is a dual target, which has already been the subject of extensive discussion in international meetings, for ensuring an improved performance:

(1) To improve the dissemination of information and to undertake a concerted action on the part of the various actors: research institutions, universities, industrialists and financiers.

(2) To promote integrated actions: research innovation - experimenting - dissemination.

In our view, the NGOs could play a decisive role in the final stages of the second process, because of their capacity to adapt themselves to conditions on the spot.

(3) Steel, metals

We have already drawn attention to the characteristics of the metal industry. At the stage of manufacture of metals and semi-finished products, it seems very difficult to escape the logical consequences of the world market for the industry: heavy capitalist concentration and marked vertical and horizontal integration.

If one examines more particularly the finished products, roofing sheets account for the bulk of the market. This is the basic material for a simple technology which is well-integrated in the know-how network. The development of a local industry is closely bound up with the ability to control quality. For in the long run, the major problem will be how to combat corrosion effectively: hence the importance of galvanization operations, for example.

(4) Wood

Wood for building is of course an industry which begins with forestry and forest exploitation. The problems connected with the development of

forest exploitation are well known, as also the threat which hangs over the conservation of forest resources. The promotion of secondary rapid-growth tree species should bring about an improvement in two ways:

(1) A direct effect, by replacing forest exploitation by forest management.

(2) An indirect effect, by involving the populations in the production and profits of this industry.

The social value of the forest heritage would be thus enhanced; in many countries, this is a vital challenge.

Important technical research has been conducted into the secondary tree species, in particular in Africa by the Tropical Forest Technical Centre. There can be no doubt as to the possibility of using these woods for building purposes, both for structural elements and framework and for woodwork and formwork. The studies now under way - which are important - deal with optimization. The development and dissemination stage, which will follow, is an essential one.

A great many NGOs have a wealth of experience in rural and agricultural matters and could naturally make an essential contribution to this action.

The wood industry comprises another area which offers a promising field for development activities: it is that of cutting up, sawing and treatment operations and the manufacture of plywood, fibreboard and laminated (glued) wood.

This is a field in which the structure of investments favours the needs and possibilities of the developing countries. But here too the challenges in the matter of training constitute a decisive factor. The choices made with regard to equipment in machine tools must be such as to avoid resort to very sophisticated machinery to carry out all operations. In addition, the maintenance and utilization of the equipment must be rapidly transferred to the local staff.

The problems peculiar to the manufacture of wood components are perfectly similar. It would be of advantage to dispense widely the carpentry workshops for building materials, in order to benefit from the advantages connected with low-cost transport for cumbersome products. Actions to supply

managerial skills must necessarily include an in-service training in the management of stocks and orders, as well as of the financial constraints connected with them.

4.2 The utilization of building materials

It is essential to realize that the promotion of a building materials industry presupposes a utilization of those materials which is both rational and conducive to savings. This is all the more so where the national economy is in the process of development. Building materials are not consumer goods; they are intermediate products. Their over-all competitiveness can only be assured where the means for a rational and performing utilization exist.

Economic assessments and development projects must therefore adopt an integrated approach, embracing even the making of the final product: building, engineering works, road, etc.

The role of the NGOs can be very important provided the actions undertaken are strongly integrated and associate not only the financiers and industrialists but also the designers and producers of the works. The NGOs which have a good experience of achievements and experimental workshops could be the driving force for the major part of this process, in particular by activating relations between the various actors.

The studies now under way on the optimization of the use of building materials are very advanced in many fields. The need is generally realized to move from natural-size experimentation to the stage of dissemination. Many programmes have already embarked on this course.

There appears, however, to be a lack of co-ordination between the professionals of the building trade and those of industry. It would probably be of advantage to be able to involve those two sectors in the projects and in co-ordinated action.

Another important aspect is that of the adaptation of specifications, standards and regulations to conform with actual needs. This is perhaps the most decisive action, and one which would make it possible to improve housing conditions for the underprivileged. The most striking case is that of cement. This product often possesses qualities greatly in excess of what would be strictly necessary - a situation which is detrimental to economic performance.

It is therefore logical to replace it by a lower-quality product. This enterprise, however, can be dangerous unless accompanying measures are taken for the purpose of avoiding all mishaps in the process of implementation.

The success of these new products depends on several types of action:

(1) An action in the matter of research

By using value analysis methods, the various research agencies can aim at a number of modifications in the products, in order to adapt their qualities to existing needs. These objectives once defined, research into substitute products must be effected by means of consultations between the technical and economic experts on the one hand, and between the industrialists and prime contractors on the other, in order to ascertain the feasibility of the industry as a whole, from the supply of raw material to implementation and satisfactory operation in the course of time.

These actions are not new in Africa and a number of projects are well advanced: wood industry, stabilized earth industry, plaster, stone, etc. Many research laboratories have already acquired a solid reputation in these fields of activity.

There is, however, one dark spot in this encouraging picture and it relates to the circulation of information, to consultation and to regional, sub-regional and sometimes even national co-ordination.

An action on the part of specialized NGOs would thus be timely, even if confined to the circulation of information.

(2) An action in the matter of experimenting and dissemination

The problem of moving from the laboratory to the actual works is often a crucial one. Despite all precautions and preliminary studies, the final application of the new products raises a whole series of problems, in particular that of the dissemination of the new know-how and that of the sociological acceptance of any innovation.

This brings us to the challenge of the multi-disciplinary approach; only those actions which are fully and consciously integrated have any real chance of succeeding without involving any technical, economic, financial, social, public health, etc. drawbacks.

The examples in this respect are many and well known.

The NGOs working in the field often possess a multi-disciplinary network of abilities either within each organization itself or through contacts with other NGOs.

They thus have a major accompanying role to play - potentially at least - in the dissemination of the products of the building materials industry.

Their action must, however, be clearly understood as being absolutely provisional in character and pride of place must be given to the question of counterpart staff and to problems of transfer of know-how.

(3) Support from the administration authorities

This support is indispensible in the developing countries, in view of the frequent weakness of the economic fabric, the production apparatus and the market structure. This support can be direct, in the form of financing, of tax concessions, of promotion and supply of managerial staff, of training, etc. It can, however, also be merely indirect, through the enactment of relevant regulations and standards, support for co-ordination activities, or administrative facilities. This second group of measures is clearly more important than might be thought at first sight.

It can be of decisive importance in connection with an intervention by an NGO.

4.3 Distribution of building materials

We must stress once again the importance, complexity and, in one word, the strategic relevance of the distribution of building materials, i.e. of the process starting at the production unit and ending at the site of works where the materials are delivered.

As we see it, there is here a vast field of studies to be undertaken:

(1) Economic studies

Transport costs in general are the subject of important research work but the particular case of building materials - which are bulky or cumbersome - undoubtedly deserves special attention both with respect to means of transport and infrastructures as with respect to storage and handling equipment.

(2) Commercial studies

In view of the low value added content and the small profit margins, the trade in building materials experiences difficulties which are often difficult to solve locally.

(3) Financial studies

As is well known, suppliers' credits play an important role in building activities, because building materials are in effect intermediate products utilized more often than not by the Contractor, who is an economic agent possessing limited financial resources of his own.

A study of existing distribution networks would reveal the extreme complexity arising from the co-existence - and overlapping at various levels - of modern networks which are the outcome of the large trading firms and traditional networks born of the pre-colonial era - which are still very much alive - as well as the networks which were set up during the colonial period and which have undergone a complex process of evolution, that started with the original stage of the trading post and tropical goods traffic.

These studies, until now perhaps somewhat neglected, could point the way to substantial savings, through the elimination of the malfunctioning and excess costs arising from the multiplicity of intermediary agents; they should lead basically to the promotion of better-adapted networks, etc.

In addition, certain concrete measures can be envisaged already - measures in which the NGOs could easily become involved.

(1) Financing and negotiation of the purchase of materials

The aim of this action would be to promote, guide and train buying co-operatives which would have the advantage of shortening the circuits, reducing management costs, strengthening negotiating positions and opening up prospects of financing, particularly on concessional terms.

(2) Guidance and training for small traders

This is a traditional task of assistance and training for management - of which there are a great many examples and the usefulness of which does not need to be demonstrated.

(3) Banks of materials

The action of these banks, which is more direct, should serve to off-set, where this is necessary, the defective operation of distribution networks. Financed with assistance funds, these banks would not be intended to last; they could in due course be converted into co-operatives.

On occasion, these banks could perform a not inconsiderable role in the struggle against speculation.

4.4 General prospects of action

By way of conclusion, we may stress the need for the NGOs to shun policies of direct intervention on the work sites. Measures of this kind bear too great a resemblance to substitution of the production agents in the building trade; they are bound to be sterile if the counterpart problem is not fully and completely solved.

Assistance could with advantage be directed towards supporting the independant economic agents. This assistance would focus on co-ordination, guidance and training. It should be extended also to various fields connected with building and industry.

Concern with the multidisciplinary approach is a fundamental matter. That approach covers a multitude of aspects - social, financial, technical, commercial, pedagogical, etc.

In this way, the chances would be increased of seeing NGO action fully integrated in the life of the economy.

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THE INVOLVEMENT OF NGOS IN THE DEVELOPMENT OF THE AGRICULTURAL MACHINERY INDUSTRY IN AFRICA**

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I. Introduction

According to FAO sources, the population of Africa which was estimated in 1980 to be 370 million will attain the figure of 688 million in the year 2000. The same sources pointed out that the Continent will need 49 million more tons of cereals. To attain at least part of its food self-sufficiency target, the Continent needs to develop, among other inputs, the promotion of a national agricultural mecanization. This will need an optimum selection of types of machines and equipment judiciously interrelated with the human factor, the soil and the water, the ultimate goal being the improvement of productivity, elimination of hard labor, creation of job opportunities, and amelioration of the conditions of living in rural areas. Unfortunately, the production of agricultural machinery and implements in Africa is in crisis, due to the fact that it is directly interrelated with agriculture and industry, two areas undergoing tremendous difficulties. African manufacturers of agricultural machines and equipment have been complaining that the major constraints which hamper their activities have been a mainly unorganized demand which is basically satisfied through importation. But it should be noted that the major characteristic here is the gap between the real needs of African farmers and the actual level of consumption, i.e. the difference between the real demand and the apparent demand.

1. Demand for Agricultural Machines and Implements in Africa

It is very much difficult to identify the needs of agricultural machines and implements in Africa. The main reasons for this situation are: (a) lack of information on local production, (b) incompleteness of statistics, (c) non-identification of many implements used in agriculture. A study carried out by UNIDO on 16 countries confirmed:

- a very low level of production;
- big fluctuation of imports;
- big percentage of motorized equipment in the overall importation of agricultural machinery.

The study was based on sample countries for each sub-region: North Africa - Algeria, Egypt, Sudan; West Africa - Ivory Coast, Mali, Nigeria, Senegal, Togo; Central Africa - Burundi, Cameroon, Zaire; Eastern and Southern Africa - Ethiopia, Kenya, Madagascar, Tanzania, Zambia.

In North Africa the demand of agricultural machinery is essentially related to motorized equipment. This equipment is partially manufactured locally. The growth of the demand for motorized equipment is due to the policy of incentives to mecanized agriculture. Hand tools and animal-drawn implements are basically supplied by local blacksmiths and small artisans in North Africa. Exception is made with Sudan which is having a growing import of hand tools.

The demand in West Africa is essentially associated with animal-drawn implements and, to a lesser extent, motorized equipment, with the exception of Nigeria. This motorized equipment is required by rich private people, agro-industrial firms, cooperatives and governments. The demand for animal-drawn implements may increase if proper incentive policies are introduced and production of animals encouraged. The actual tendency shows the willingness of many West African governments to mecanize agriclture through animal-drawn implements. Despite the absence of statistics, one can assume that there is a substantial consumption of hand tools since mecanization is very low in the agriculture of the sub-region.

The demand in Central Africa is dominated by hand tools. Animal-drawn mecanization is relatively absent and power-operated machinery use is very low. Big plantations and small farmers prefer to use high quality tools manufactured in modern production units like TROPIC in Cameroon or Chanimetal and UMAZ in Zaire, instead of those manufactured by local artisans and blacksmiths. An increase in the importation of these implements, particularly from Asia, has been noticed.

The demand in Eastern and Southern Africa concerns hand tools for small traditional farmers, animal-drawn implements for middle level farmers and power-operated equipment for large scale farmers or government plantations. The use of animal-drawn implements has been growing in the sub-region, particularly with the promotion of agricultural development projects.

2. Local Production of Agricultural Machines and Equipment

Besides imported equipment, African farmers are supplied by Agrican urban manufacturing industries and local blacksmiths and artisans. African industry offers a wide range of equipment, from simple tools to complex machines like tractors. But in many countries these industries are undergoing very harsh financial and technical difficulties.

Table 1

Importation of Agricultural Machinery in Developing African Countries - 1973-1979

Year	World Trade	Importation of Developing African Countries (in thousands US)	Equivalent part of World Trade %
1973	4 343 896	219 687	5.1
1974	5 997 526	329 936	5.5
1975	7 979 778	532 749	6.7
1976	8 007 736	483 489	6.0
1977	8 857 586	609 321	6.9
1978	9 734 685	738 739	7.6
1979	11 879 868	487 104	4.1

Source: UNIDO series of Sectoral Studies
(United Nations Bureau of Statistics)

Table 2

African sources of importation for agricultural machinery

(in thousands of dollars)

Importers	Exporters								
Sub-region Country	Western Europe	US & Canada	Other Developed Countries	CAEM	Developing Countries	African Developing Countries	Sth Afr.	Others	World
N. Africa	200,595	14,195	5,361	11,833	2,603	352	-	1,230	236,172
Algeria	32,722	3,247	1,485	3,340	763	283	-	10	41,891
Egypt	10,144	1,441	360	6,948	163	-	-	-	19,069
Sudan	14,028	5,689	37	285	1,654	18	-	-	21,713
West Africa	56,337	24,632	10,763	240	3,963	705	-	1,087	97,731
Ivory Coast	14,647	10,939	2,623	-	569	63	-	1,087	29,931
Mali	2,663	188	17	-	-	16	-	1,087	2,885
Nigeria	19,009	6,263	2,900	-	982	2	-	-	29,158
Senegal	2,781	750	34	-	51	-	-	-	3,610
Togo	1,357	166	4	-	-	5	-	-	1,534
Central Afr.	18,757	17,304	632	104	91	931	-	320	38,150
Burundi	465	239	-	-	-	-	-	-	706
Cameroon	11,789	9,316	348	93	91	597	-	329	22,566
Zaire	3,456	778	140	-	-	7	-	-	4,377
Eastern and Southern Afr.	74,047	19,019	10,366	5,744	3,195	893	1,780	-	115,040
Ethiopia	7,868	382	1,885	5,658	102	-	-	-	15,897
Kenya	15,340	1,540	2,686	-	688	-	-	-	20,557
Madagascar	6,049	2,517	590	85	62	105	-	-	9,411
Tanzania	12,684	2,537	2,767	-	689	11	-	-	7,892
Zambia	6,531	760	132	-	-	468	-	-	7,892
Total Africa South of the Sahara	163,170	66,645	21,800	6,374	8,905	2,549	1,780	1,417	272,645
All Developing Countries Africa	349,737	75,151	27,124	17,922	9,855	2,822	1,780	2,647	487,104
LDCs of Afr.	66,174	18,623	6,535	6,184	3,974	1,182	1,720	-	104,997
Total Africa	442,634	122,484	38,138	17,922	22,004	2,883	1,780	2,647	650,496
Total World	6,343,628	3,567,153	765,984	930,990	228,679	4,522	10,708	28,200	11,879,868

Source: United Nations Bureau of Statistics
UNIDO Series of Sectoral Studies

Blacksmiths and other artisans, although numerically the most important, are limited to the production of simple hand tools. The share of these two groups of suppliers on the African market is less than 10%. (This figure is far lower when we consider Africa south of the Sahara). For the whole of Africa (except the Republic of South Africa), the total production of urban industries is estimated at US$150 million per annum, meeting only 10% of total requirements. But the interesting fact to be noted here is the high level of specialization at sub-regional level, explained by the similarity of ecology and agricultural techniques. The production of equipment by artisans can be defined at three levels: the traditional blacksmiths, the modern blacksmiths and the artisans-mecanics.

3. Importation of Agricultural Machinery and Equipment

According to statistics, Africa spent US$650 million annually between 1976 and 1979 to import agricultural machines. 65% of these machines are tractors. If other motorized equipment used in agriculture is added this percentage can reach 90%. Table 1 shows that the African market represents only 5% of the world market compared to its population - this figure is just too low. This phenomenon explains why many multinationals hesitate to involve themselves in the African market. Except for hand tools, the main suppliers are Western Europe (72%) and the United States (15%). Inter-African trade of this equipment is limited to 6% only, while South-South supply is estimated at 2% (see Table 2).

4. Relationship between Needs, Production and Import

There is no African country which has achieved self-sufficiency in agricultural machinery. Moreover, locally manufactured equipment includes up to 60 to 80% of imported components (raw materials, special parts). Tractor manufacture is limited to the assembly of basically imported C.K.D. or S.K.D. The apparent demand for agricultural machinery is estimated at US$1.5 million per annum, representing only 15% of total import of capital goods. Within Africa, the North African sub-region attracts 50% of the needs of African developing countries. Eastern and Southern Africa comes second with 33%, followed by West Africa 20%. Central Africa counts only for 8% of the total value of imports. The biggest importers in Africa are: Algeria 6%, Cameroon, Kenya and Sudan 4,5% and the United Republic of Tanzania 4%.

It has already been pointed out that 65% of this equipment is power-operated; 80% is bought by the big farmers, while the rural population acquires less than 5%. In other words, majority of Africans (peasants and village communities which account for more than 70% of the population) are getting less than 5% of the total value of expenditure in foreign currency by governments, as far as agricultural machinery is concerned. Such an imbalance can lead only to the aggravation of the fundamental under-equipment of traditional agriculture and rural activities, consequently affecting negatively the success of the agricultural sector and encouraging rural exodus.

It is clear that the nature of supply and demand interrelationship is determined by the degree to which the design of machinery and equipment takes into account the requirements of the user, the performances expected, the conditions of use, the possibilities offered by the local production structures, and the materials available. Appropriate design could also lead to the reduction of maintenance operations and technological dependence.

It is therefore vital for Africa that the present trend be corrected. UNIDO has been working towards this objective through subsequent meetings and projects at national, sub-regional and regional levels. African leaders have as well admitted the challenge put forward for the development of agriculture, agricultural mecanization and supply of agricultural machinery in the Lagos Plan of Action. The Plan insisted on the necessity to produce locally and in sufficient quantities agricultural machinery and equipment in order to reduce dependence on the industrialized world. The document further expressed that this production should be achieved within the framework of an industry working towards the satisfaction of the fundamental needs of the society and its modernization. In order to accelerate the achievement of these objectives, the Lagos Economic Summit adopted the years 1980-1990 as the Industrial Development Decade for Africa (IDDA). The objective of this paper is to find ways and means to promote and rationalize the role of non-governmental organizations (NGOs) in the development of agricultural machinery and equipment within the context of the IDDA.

II. Present Status and Involvement of NGOs

1. General Status of Development of Agricultural Machinery

The general outlook of agricultural machinery industries in Africa is broadly based on the manufacture of simple tools, implements, simple agricultural pre and post harvest machinery. Complicated agricultural machinery and equipment are in most cases imported from developed countries. However, the nucleus engineering industries, still at their formative stage, participate in the fabrication work, sub-assembly/assembly operations and, in very limited cases, spare parts manufacture for tractors as well as processing and storage facilities of a complicated nature. As already stated, local supply of hand tools, agricultural machinery and equipment in Africa is undertaken by the following groups of manufacturers:

- The local blacksmiths
- The small artisans
- The small-scale urban manufacturing units
- The large and medium-scale assembly plants

a. The Local Blacksmiths

Village blacksmiths exist in all African countries and still continue to supply their communities with hand tools such as matchets, hoes, etc., as well as different products needed for daily ordinary living in rural areas. This group of people is characterised by the following:

- The equipment they use is limited in quantity and quality. Usually, that equipment is manufactured by the blacksmiths themselves. It should be noted that a new generation of modern blacksmiths is coming up with an increased use of equipment manufactured by modern industry such as shears, special players, etc.

- The training is usually done on-the-job and knowledge is transmitted from father to son.

- They are generally scattered in rural areas, but sometimes grouped in places.

- They devote part of their time to agricultural work for their feeding. The traditional blacksmiths usually have their market in hand except for some widely imported products, such as matchets.

b. The small artisans

Apart from items like burglar proofs, metallic chassis, decoration moulds, the small artisans also produce hand tools and simple implements. They are more frequently established in urban peripheries. Small artisans' workshops are characterized by the following:

- The use of simple equipment and tools produced by industry: spanners, trade cutters, players, gas welding and electric welding.

- Their training is carried out on-the-job and seldom through trade schools.

- They are located in semi-urban or sub-urban areas.

Case studies show an increasing number of these small artisans not only in the maintenance of complex machinery, but also in the manufacture, in small series, of simple adapted equipment for farmers. They usually work individually, although there are examples of collective production either organized by the artisans themselves or initiated by governments.

c. The small-scale urban manufacturing units

There are a number of small urban manufacturing units in African towns using ordinary electrical machine tools and equipment. The major part of their production is geated towards the manufacture of tools and agricultural equipment. During the past ten years, the organization of manufacturing networks between these units and small associations of artisans has been carried out mainly for the production of animal-drawn implements, ploughs, harrows and farm carts (COBEMAG in Benin and COREMA in Burkina Fasso). Besides finished products directly manufactured in the units, semi-finished products are as well manufactured in order to be distributed to rural artisans' workshops. The latter proceed with finishing, i.e. assembly and painting. Another approach used is to sub-contract manual sub-assembly operations to artisans before the product is finished in the main manufacturing unit.

d. The medium and large-scale plants

These are usually assembly plants, generally branches of multinational companies set up to assemble semi knock down components and produce heavy machinery as tractors, bulldozers, etc. The components are imported and production is done under licence. These types of plants exist only in big African countries like Algeria, Egypt, Nigeria, Zaire, etc. The staff are usually trained by traditional schools supplemented by in-house training in the plants' facilities. Specialized skills are developed in the facilities of

that multinational in Europe. Management and organization set up is always developed by the mother multinational companies. The use of sophisticated hand tools and handling equipment is frequent while a fairly well equiped machine shop is also available.

Having defined the categories of manufacturers of agricultural machinery and equipment in Africa, the following step will be to study the status of their development under the following classification:

- by types of utilization
- by types of energy consumption

II-1-1 Development of agricultural machinery according to type of ulitization

According to mode of utilization, agricultural machinery and equipment can be divided into four groups: agricultural seed, harvesting, post harvest processing and storage equipment. Each of these groups will be studied below according to the type of energy used to operate them: hand-operated, animal-drawn and power consuming engines, see table 3.

a. Agricultural Seed

These are soil preparation equipment, planters and sprayers.

Hand-operated: Hoes, matchets and planting sticks are manufactured and used at village level since years and years. They still are basically produced by blacksmiths and small artisans. The designs have practically not changed, only the variety in sizes has increased. The failure to find steel alloys capable of competing with those used for imported tools has led to the smiths giving up gradually producing some items like matchets. Certain urban workshops produce these items under licence. Sprayers are practically all imported while planters are manufactured by artisans or urban industries equiped with cutting and welding instruments using imported designs.

Animal-drawn agricultural seed equipment is widely produced in Africa by small urban industries and small artisans. The items are ploughs, harrows, ridgers, cultivators, planters, sprayers. The basic designs of this equipment are imported, in other words, the equipment actually manufactured locally is made from adapted designs. In general, there are two methods of manufacturing:

i. Forging, i.e. hot benging of a semi-hand mass of steel. Holes are drilled by machine. Handles and stilts are made by bending flat bars which are riveted or bolted to the ploughbeams. Equipment obtained by this method is light and well proportioned.

ii. Cutting and welding rectangular or circular tubes with flat bars. Final assembly is carried out using bolts. The frames in this case are angular in appearance and somewhat heavier. In the face of the fast performance achieved with arc welding, forging seems to be less favoured. In almost each African country these implements are manufactured using one of the methods described above or a combination of the two.

Agricultural seed equipment operated by Power Consuming Engines usually consists of tractor drawn disc and mouldboard plough, ridger, harrow, cultivator, planters and seed drills, sprayers,etc. Like the tractor itself, this equipment is usually only assembled at local level from imported completely knowk nown components. The designs of this equipment are those of the mother multinational companies. However, it should be noted that the majority of this category of equipment is being imported. Local assembly is only done under licence.

b. Harvesting Equipment

Hand-operatéd harvesting equipment include matchets, harvesting sickles for grains and hoes, used to lift roots of crops. These are manufactured by blacksmiths, artisans and small urban industries. As in the case of hand-operated agricultural seed equipment, the quality of the products manufactured by blacksmiths and artisans is low. This is due to the poor quality of the material and equipment used, as well as skills of the craftsmen. Research is going on to close the existing gap of semi-mecanized equipment which could help and reduce the difficulty of harvesting tubers: cassava lifter in IITA*, cocoa harvester in ARCEDEM*, coffee harvester in the Ivory Coast are examples of developments in this connection.

Animal-drawn harvesting equipment are limited to root crop lifters designed like a plough to dig out the matured products. No other types of animal-drawn harvesting equipment is known to be developed or under developed in Africa.

Engine-operated equipment for harvesting of crops are combined harvester for grain and root lifters. These are usually sophisticated in design and manufacturing as well as in operation. The production of power-operated harvesters is limited to assembly in virtually all African countries.

c. Post Harvest processing equipment: These include threshers, shallers, huskers, grinders, millers, driers, boilers, presses, etc. Modern artisans and small urban industries produce hand or foot-operated food

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* IITA: International Institute for Tropical Agriculture
* ARCEDEM: African Regional Centre for Engineering Design and Manufacturing

Table 3: Locally Manufactured Agricultural Machinery and Equipment

	Mode of Utilization / Type of energy Consumption	Hand-Operated	Animal-drawn	Power-Consuming Engines
I.	Agricultural Seed	- Hoe, planting stick - Hand pushed planter - Sprayer	- Plough - Harrow - Ridger - Cultivator - Planter - Sprayer	- Disc plough - Mouldboard plough - Ridger - Harrow - Cultivator - Planters and Seed drills - Sprayers
II.	Harvesting	- Matchets and Harvesting knives - Sicles - Hoe - Root lifter	- Root lifters, i.e. groundnut lifter	- Combine harvester - Roots harvester
III.	Post Harvest Processing	- Threshers - Shellers - Grinder - Drier - Boiler - Press	- - - - - -	- Threshers - Sheller - Husker - Grinder - Miller - Drier - Boiler - Press
IV.	Storage Equipment	Improved traditional storage	-	Silles with humidity control

processing equipment. These are usually adapted from Asia or Latin America, although the development of local design is being promoted. The aim is to reduce labour and increase productivity with a limited capital input. IITQ, ARCEDEM and many other institutions at national level are working in this field in order to increase productivity with the use of very simple equipment.

Stationary equipment with ancillary motors of this category are produced in small or medium-scale urban industries. It should be noted that not many countries are involved in the manufacture of these types of equipment. Most of the time the engines are imported. In Algeria, Egypt, and Zimbabwe they are assembled under licence. CENEEMA in Cameroon (Centre for Study and experimentation in agricultural machinery) has developed threshers and winowers from IRRI. SISMAR in Senegal has successfully developed decorticators and shellers now produced in many other West African countries.

d. Storage equipment: Improved traditional storage equipment is still under development and efforts are being made to promote traditional storage systems as well as introduce new methods of binding simple low cost storage facilities.

Fabricated sillos from sheetmetal and with humidity and temperature control equipment are being imported intensively in Africa. These have proved not to be adaptable to tropical conditions. Unfortunately no major research is known to be going on for the development of the right facilities for long-term storage. It is believed that fabrication techniques available in Africa are adquate for the production of sillos. Blowers and fans could as well be manufactured locally while electric motors or engines could be imported to complete the units.

II-1-2 Development of tractors

Simple tractors of less than 30 H.P.

Certain attempts to develop and produce small tractors locally have been going on since some years, with a varying degree of activity. The Tinkabi tractor in Swaziland and the PANGOLIN in the Ivory Coast stand for examples. However, various reports (see A.K. Mitra, Swaziland report on Tinkabi) seem to show very poor performance of the tractor to justify its price. These machines were planned for local manufacture, provided that engines, geat boxes, wheels and hydraulic components can be imported.

In fact, manufacturers in industrialized countries have stopped producing these models since the 1950's and left over such as little Fiat 300 which may be suitable for use on Savannah type terrain will not work in forest or flooded soils. There are virtually no multi-purpose mini tractors

suitable for all types of soil. Consequently the market for low-powered tractors is relatively small, thus affecting their development. But the problem of a limited market can be eliminated if they are manufactured in a multi-purpose production workshop or network that concentrates on a wide range of equipment, provided that no special and costly equipment is required to manufacture the tractor.

Heavy agricultural tractors

Local manufacture of heavy tractors is handled by medium and large scale production units. The production of these tractors includes entire assembly of imported CKD or SKD under licence. Countries like Nigeria, Algeria, Egypt, Zaire, Zimbabwe and Cameroon are leading in this field of manufacture. There is a lot to do for the organisation of the local manufacture of at least some simple parts.

Another interesting line of manufacture which could be undertaken is the one for satellite equipment to the tractors: welded frames for cultivators, tillers, farm trailers since these represent tenths of the price of the main machine.

II-2 Major Constraints hindering the Development of Agricultural Machinery

A healthy agricultural machinery industry can only exist in symbiosis with a healthy agricultural industry. This is true since only that sector of farming which is above subsistence level provides any significant prospect for sales of agricultural machinery and equipment. To analyse the problems affecting the development of agricultural machinery, two groups of manufacturers will be considered. They are artisans (including blacksmiths) and urban industries.

II-2-1 Artisan Production

Various problems have been observed to commonly affect production under this category:

a. Lack of adequate supplies of raw materials: The production depends on supplies of new or scrap raw material from nearby towns or cities which in most cases are irregular. Supplies are made on a daily basis without any storage or group purchase facilities hence without the possibility of earning discounts on bulk purchase. Consequently, final products are expensive and often of poor quality.

b. Lack of finance and non-access to financial facilities

Artisans consume their daily incomes and do not use any revolving fund or capital. With the difficulty of generating sufficient incomes from maintenance services, they prefer to sell finished products. Financial resources

are practically always scarce since most of them don't have access to credit facilities.

c. Inadequate market outlets: The quantity of orders is too low, and the markets are irregular. Orders for one outlet are very diverse and each client presents a particular problem and hence standardised manufacture of a product is impossible. Moreover, artisans are now facing an increasing competition of industrially manufactured agricultural equipment from importation as well as local manufacture.

d. Lack of training: Artisans lack adequate training which could allow them to reduce time of manufacturing without affecting the quality. In most of these workshops application of jigs, fixtures and other production facilities is very limited thus affecting the productivity and quality of final products. Any improvement on quality as a result of new inputs like supply of designs is limited since this is linked with greater time spent.

e. Diversity of occupation: Many artisans have to as well farm to feed their facilities. This state of affairs creates a situation whereby the artisans don't concentrate on their crafts. Some of them are also small merchants.

f. Insufficient or absence of institutional support: Activities, organisation and problems of artisans are ignored by many national authorities. Rare are those countries having an institutional framework to promote rural artisans; and where it exists, it is only for urban-based artisans. Village blacksmiths, the most important in number, are left to themselves.

II-2-2 Urban Industry Production:

Practically all urban indus-ries are facing two types of difficulties: structural and financial. Today, these difficulties are such that many agricultural machinery and equipment manufacturers run the risk of disappearing.

Structural difficulties: Industrial production companies located in African developing countries lacking industrial infrastructures and transport have to face following problems:

a. Lack of adequate supply of quality raw materials and semi-finished products, for example special steel and specially forged or mechanical parts. In fact, supplies of raw materials are often delayed, and 6 to 9 months could be spent between placing the order and receiving the goods.

b. Lack of a developed capital goods sector and maintenance facilities: All manufactured machinery and equipment are imported. Consequently, spare parts are difficult to get and maintenance is therefore affected. It is also difficult to organise a network for maintenance and supply of spare parts. The market is scattered and far from production facilities, and road infrastructures are poor.

c. Unavailability of a locally trained man power, i.e. technicians, workers, etc.

d. Lack of design and adaptation capabilities: Including for engineering groups at national level, there is a complete absence of a capability to design or adapt agricultural machinery to suit local demand and available manufacturing facilities.

e. Inadequate system of assistance and promotion of small-scale industries and absence of institutional framework for this purpose.

Financial difficulties

The difficulties at the level of the marketing constraints cannot be overemphasized, and are characterised by the following:

a. The market capacities are limited, since the products are sold only at national level. Intra-regional trade is almost non-existent. Market outlets are further made difficult by the wide diversity of equipment demanded for manufacture. As a consequence, the quality of each equipment to be produced is reduced, adversely affecting possibilites of large-scale manufacture.

b. The insolvency of the rural population, aggravated by the reduction of their incomes. Besides, governments do not devise any efficient policies to help resolve some of these difficulties. Financial assistance to agriculture remains low. Prices of agricultural products are kept low. Incentives for the purchase of equipment are low.

c. Lack of stable market: Frequent changes in agricultural policies, changes of policies on importation, imports in a framework of bilateral inter-governmental arrangements, frequent reshuffles of companies are some of the factors that account for such a situation.

d. High cost of equipment: The increasing cost of steel which doubled between 1974 and 1978, as well as capital goods, energy and consumable industrial products, coupled with poor management, led to a high cost of agricultural

machinery and equipment. In fact, manufacturers had to increase the price of products to cover ex-factory costs in such a way that they go beyond the financial capabilities of their customers.

II-2-3 Sociological Constraints

At the manufacturing level, blacksmiths are still remaining very conservative and reluctant to use modern equipment and technology. They sometimes reject welding or vertical forgings. Poor management has also been a major constraint to urban and small-scale manufacturers. If they are of the public sector, their managements are careless, which characterizes a majority of African government companies. It is usually considered that anything belonging to the government does not belong to anybody in particular.

On the user's side, the awareness of a culture based on the use of machines is still absent in many African farmers. A majority of them are practising the subsistence agricultural system, using hand tools. A sudden change in farming techniques by the use of sophisticated equipment would only create more problems.

II-3 Areas in which NGOs are more active

The Fourth General Conference of UNIDO requested the Secretariat to strengthen further its coordination role not only with organisations of the U.N. system and other relevant governmental and inter-governmental organisations but also with non-governmental organisations whose work is related to the development of industry.

In accordance with UNIDO programme of cooperation with non-governmental organisations, these are classified as follows:

- Regional, sub-regional and national NGOs
- Chambers of Commerce and Industry
- Industrial Associations
- Financing and Banking Institutions
- Universities
- Research and Development (R and D) Institutes
- Cooperatives
- Trade Unions
- Other non-governmental organisations (religious associations/clubs, etc.)

Being at international or national level, non-governmental organisations play a certain role in the industrial development of their respective regions. However, there is limited information in connection with their activities. In order to study their impact on the development of the agricultural machinery industry, we would consider the following areas: design, production and marketing, repair and maintenance of equipment and training of personnel.

Design: In many African countries universities and R and D institutions carry out a lot of research work in the field of design, development and testing of agricultural machines and equipment. Unfortunately, this work relates more to the theoretical than the practical aspect, that is giving answers to the real needs of farmers and manufacturers. A lot of prototypes exist today in faculties of engineering and/or technology, but they have never been manufactured commercially, because of the missing link between universities, R and D institutions and manufacturers.

At the international level, institutions like the International Institute for Tropical Agriculture (IITA) are also working in the design and adaptation of agricultural equipment. For instance, IITA has developed an injection pilling planter adapted to minimum tillage system. This planter has performed satisfactorily in a number of African countries. Samples of single and double row planters are now successfully being utilised in Nigeria, Cameroon, Burkina Faso for maize, beans, cow peas, etc.

However, the effort to get this equipment widely manufactured has been unsuccessful. Most of the time this equipment is handed over to governments who in turn pass it to local manufacturers for the construction of a fixed quantity. The lack of contact during manufacturing between the manufacturer and the designer, i.e. IITA, leads to a poor quality of the finished product, resulting in a bad performance of the planters in the field. Consequently, the planters are rejected by the farmers in the following planting season. For obvious reasons, financial and banking institutions decline to give any direct support to research in almost all African countries.

Production: Industrial associations, Chambers of Commerce and cooperatives play a significant role in the industrial production process in general, and agricultural machinery production in particular. Industrial associations such as Metal Engineering Industries Development Association (MEIDA) in Tanzania

have facilitated the production of matchets in some industries in Tanzania through the development and production of dies, punches, jigs, and fixtures. The association has also enabled production of plough shares from rejected and/or old rail line materials.

Two groups of cooperatives, i.e. cooperatives of modern blacksmiths and cooperatives of artisans are involved in the production of agricultural machinery in Africa. In countries like Kenya, Nigeria, some private financial and banking institutions assist the production of agricultural equipment through these cooperatives although it is difficult to get such facility due to complicated bureaucratic and very rigid conditions.

In countries like Tanzania and Sierra Leone, religious bodies like Christian associations (R.C.A.) have some workshops in which simple equipment is manufactured. The Agricultural Experimental Station in BO, Sierra Leone, under the auspices of the Methodist Mission for example, produces cassava graters which have been successfully sold in the country. However, the lack of good designs and manufacturing capabilities is affecting the quality and performance of their production.

Marketing: Industrial associations and Chambers of Commerce promote the marketing of agricultural equipment through trade fairs and exhibitions. The major constraint for promotion of sales of agricultural equipment is the lack of circulation of information. Besides trade fairs and exhibitions, there are almost no other means of communication to inform the public of the availability of equipment in the local market i.e. pamphlets, advertisements, etc., since these require knowhow in advertising techniques. When available, these techniques are too expensive for monetary facilities available to the producers. Very often, spaces in trade fairs are too expensive. It is suggested that financial institutions as Banks of Commerce and Industry, Religious and Industrial associations finance the participation of small manufacturers into trade fairs, as well as assist in the preparation of pamphlets and other advertising documentation.

Repair and Maintenance: One of the biggest bottlenecks hampering the development, manufacture and utilization of agricultural machinery and equipment is the lack of proper repair and maintenance facilities, as well as adequate skills for the same purpose.

Usually, maintenance is organized by the individual organisations. In case of a fault necessitating high technical knowledge, outside specialists are called in. Since some of the components are not produced locally, repairs are often delayed.

As most of the capital goods used to produce equipment are procured abroad and for other reasons, spare part supplies are hardly regular, resulting in unnecessary delays in production. Maintenance systems are usually inadequate.

Chambers of Commerce and Industrial associations do sometimes organise seminars to assist in promoting maintenance standards. It is suggested that these seminars be organised more frequently and designed in such a way as they would have an impact on the users. Instead of inviting officials to discuss maintenance, it is better to organise discussions with technicians directly involved in the maintenance process. In Tanzania, the Tansanyike Farmers Association (TFA) centralises the needs of spares of different members in order to place bulk orders from foreign suppliers. This approach should be encouraged since it reduces the burden on individual manufacturers and enables them to save time and money. The international NGOs should also assist in setting up facilities for the storage of spare parts and upgrading maintenance techniques.

Training: Many non-governmental organisations are involved in the teaching of mechanical engineering skills which are basically required in agricultural machinery and equipment manufacture. Industrial associations, Chambers of Commerce and trade unions organise short seminars mainly aimed at improving productivity and marketing, and also sponsor trainees in different trades and other specialisations. International NGOs sponsor the training of staff through national NGOs or governments, as well as through arranging industrial attachments overseas.

Religious associations often have Vocational Trade Schools, which teach different technical skills like machining, welding, blacksmithing, metal forming, carpentry, etc. Although these arrangements are relatively successful compared to actual needs, they still appear to be insufficient. It is suggested that these kinds of schools be promoted in rural areas to train young people. Training programmes should aim at creating a spirit of self-sufficiency, self-employment and/or collective employment in the trainees.

University programmes in most African countries are not usually adapted to national industrial needs. Moreover, it is not possible to orient the students to narrow specialisation demanded by industries in the present age of competition. While the graduates on completion of university courses possess fairly wide-based theoretical knowledge, they require industry-oriented training in specialised fields like design, manufacture and maintenance of machinery which form the basis of industrial production. Consequently, there is no other option but to organise training in these vital areas in Africa.

International NGOs like IITA should assist in this area which is today covered only by the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM). Besides the re-adaptation of their programmes, universities should be organising practical training seminars for middle-level workers located within their areas or regions, at least.

II-4 Linkage between R and D activities and NGOs

A very low level of activity in research and development of the manufacturers affect the technological progress as well as design and adaptation of agricultural machinery and equipment in the African region. Except for the International Institute for Tropical Agriculture (IITA) which is directly involved in the testing and adaptation of a number of selected equipment, the role of international NGOs is limited to financing some research activities. This is an area where mainly international NGOs are present most of the time. Research and development programmes in the field of agricultural machinery are usually carried out by specialised public institutes under the auspices of the Ministry of Agriculture and/or Scientific Research. Except for the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) which is an Intergovernmental organisation, there is no sub-regional or regional organisation or association which deals with the design, adaptation, testing and manufacture of prototypes of agricultural machinery and equipment. As explained earlier, proper and effective linkages between R and D institutions, various industrial manufacturers and various national, sub-regional and regional NGOs are yet to be established.

The flow of information and prototype exchange is very limited. A single activity can be repeated in different neighbouring countries. Coordination of programmes does not exist and contacts between personnel, specialists and organisations are rare. Moreover, a majority of prototypes remain as they are

for the fact that (a) there is no link between R and D institutions, universities and manufacturers; (b) no finance to ensure the production of prototypes in pre-series, other factors being (c) the lack of competence in the field and (d) the absence of guarantee as far as viable markets are concerned. However, some adaptation of imported equipment has been carried out with the help of foreign experts showing the existence of possibilities at that level of potential technical cooperation. In the past, such programmes failed in some cases due to an incorrect understanding of internal administrative procedures. It is suggested that thorough analyses of past experiences in this area be made in order to promote and intensify development of local potential for technical studies and manufacturing processes.

II-5 Major problems faced by African NGOs in the development of agricultural machinery and possibilities of cooperation with international NGOs

The problems faced by national non-governmental organisations involved in the development of agricultural machinery and equipment include the following:

a. Most NGOs at national level lack adequate organisational structures and managerial abilities. There is no concrete move from these organisations in order to be involved in the economic development process. If we consider the example of professional associations of engineers, they often remain just forums of intellectualism or means of reference.

b. Local authorities do not usually pay proper attention to NGOs. This situation is created by the fact that the NGOs frequently behave just as trade unions which seek to obtain their rights but forget their orligations. As a consequence, they are hardly called upon to participate in planning the economy in general, and the development of agricultural machinery and equipment in particular.

c. In the 1979s, many governments embarked on the promotion of artisan associations and cooperatives in order to create dynamic networks for the production of agricultural machinery and equipment. However, after sometime, practically all of these were bound to face tremendous difficulties due to the following reasons:

- lack of managerial skills and technical knowledge;
- lack of relevant data on product design and manufacture;
- lack of funds;
- lack of organised markets.

d. Inadequate institutional framework to coordinate and regionalise activities of national NGOs and government institutions promoting such activities is also a bottleneck.

As explained in paragraphs 3 and 4 above, NGOs play a certain role in the development of agricultural machinery at national and international levels. To improve and strengthen this role, appropriate actions should be undertaken to promote cooperation between NGOs at national level on the one hand, and between national and international NGOs on the other hand. A possible approach to rationalise, coordinate and monitor cooperation between national NGOs will be discussed in the next paragraph.

The areas of possible cooperation between national and international NGOs can be grouped as follows:

R and D Activities: National and international NGOs could work together on the improvement of design and adaptation of farm machinery and equipment in order to satisfy the market requirements. Exchange of information on working drawings of farm machinery and equipment would be eventually developed for local manufacture either through small, medium or large-scale industries, whichever is more appropriate. Exchange of prototypes should be encouraged. These prototypes would be distributed to selected workshops/industries for adaptation after successful trial.

Manufacture: Joint ventures for the manufacture of selected agricultural equipment can be developed through cooperation with international NGOs. International NGOs seem to be interested in this area of cooperation. This approach may certainly help to overcome many of the bottlenecks hampering the development and manufacture of agric machinery and equipment in Africa.

Training: Assistance of international NGOs is required to help strengthen the capabilities in evaluation, design development and production of prototypes of equipment to suit local manufacturing conditions and markets. This cooperation can be in the form of establishment of pilot and demonstration units, especially for small and medium-scale production.

Studies and Surveys: Joint studies and surveys would be a good approach to allow complementarity and achieve more realistic results. Joint workshops/ seminars could be organised to initiate or conclude studies as well as debate on a specific item to be tackled, e.g. selection of raw material for a particular equipment or new economic production process, etc.

Exchange of Experience: Exchange of experience in management and organisation of NGOs involved in the development of agric equipment is also an important area which should not be neglected. Some regions are already having a substantial amount of experience in the organisation of cooperatives or associations working in this priority area for Africa. Their assistance in solving managerial and organisational problems in African NGOs as well as exchange of experience would be of great help.

III. Conclusions and Recommendations

Any activity to be carried out for the development of agricultural machinery and equipment in Africa, be it at national or international level, should be considered in line with the ongoing activities as stipulated in the Lagos Plan of Action and the programme of the Industrial Development Decade for Africa (IDDA).

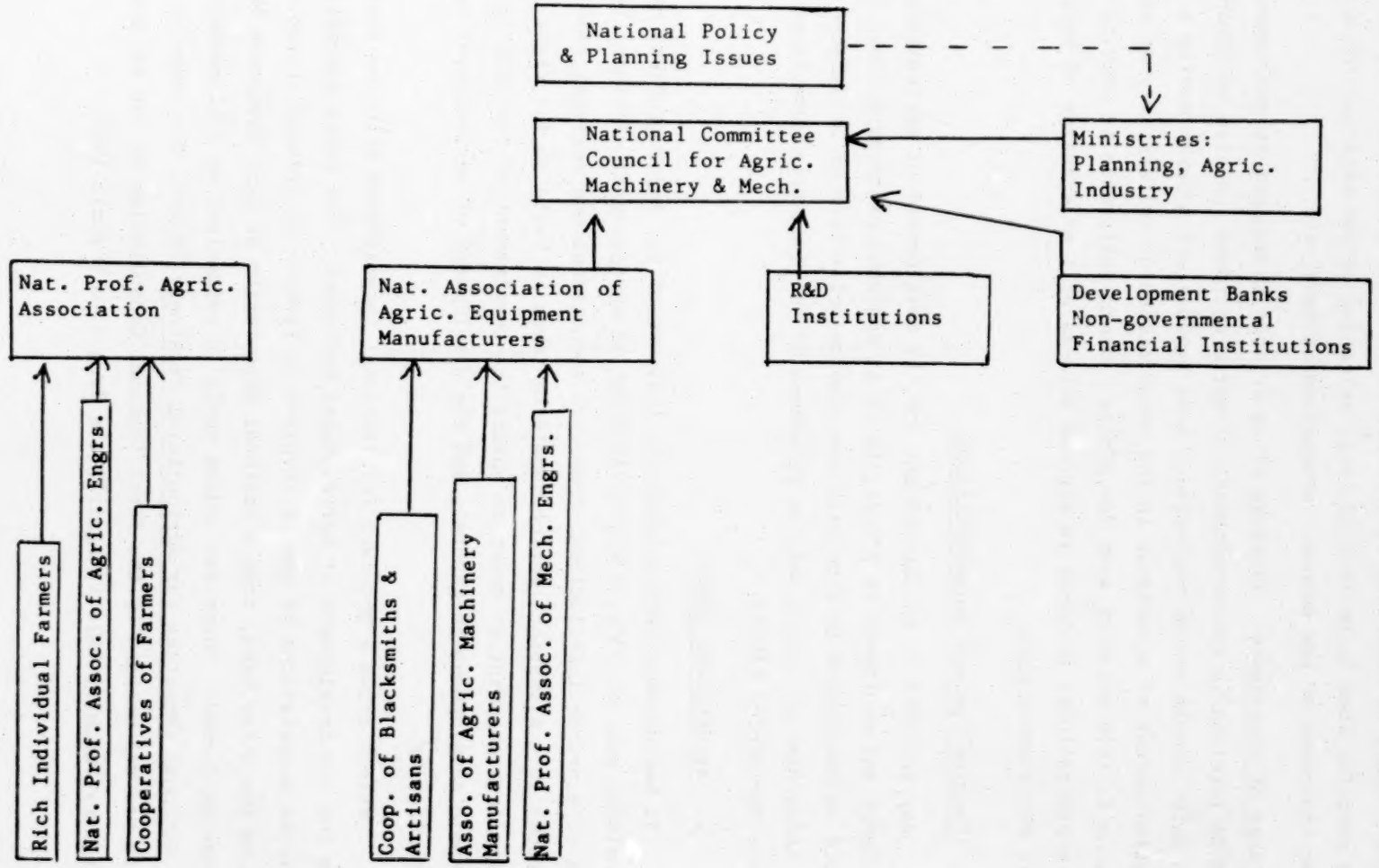
1. At National Level:

It has already been pointed out that one of the major problems hampering a positive role of NGOs in the development of agricultural machinery is the lack of a proper institutional framework at national and regional levels. To overcome this situation, action should be taken to build up the right institutional arrangement in order to ensure the involvement of the NGOs in the economic development in general, and the development of agricultural machinery in particular.

Table 4 shows a proposed institutional interlinkage with the national NGOs for the development of agricultural machinery. The chart suggests that national associations of people involved in farming be created on the one hand, and on the other hand, that a National Association of Agri Equipment Manufacturers be formed. These two bodies would be recognised as full members of the National Committee for Agricultural Machinery (NCAM), the creation of which was recommended by the first Regional Consultation on the agricultural machinery industry held in Addis Ababa from 5 to 9 April 1982.

Table 4

Proposed Institutional Interlinkage with the National NGOs for the Development of Agricultural Machinery and Equipment


National Policy & Planning Issues
National Committee Council for Agric. Machinery & Mech.
Ministries: Planning, Agric. Industry
Nat. Prof. Agric. Association
Nat. Association of Agric. Equipment Manufacturers
R&D Institutions
Development Banks Non-governmental Financial Institutions
Rich Individual Farmers
Nat. Prof. Assoc. of Agric. Engrs.
Cooperatives of Farmers
Coop. of Blacksmiths & Artisans
Asso. of Agric. Machinery Manufacturers
Nat. Prof. Assoc. of Mech. Engrs.

The farmer body will represent the customers while the latter represents the producers of agric machinery and equipment. R and D institutions, Development banks will also be represented in the NCAM. This will enable the NGOs to be involved in the policy planning process and consequently play a greater role. The decentralisation of implementation programmes will be carried out going down stream of the chart.

Governments should encourage NGOs to create these national bodies through adequate incentives and involve them fully in the planning process in order to allow them space to air out their invaluable views and opinions. Governments should also entrust national NGOs with responsibilities to carry out activities during the implementation of national plans as far as agricultural machinery is concerned.

2. By Regional Level:

Table 5 shows a proposed institutional interlinkage with regional NGOs for the development of agricultural machinery and equipment. National NGOs, regional research and development institutions and regional financial institutions will work under the framework of the Regional Committee/Council for Agricultural Machinery. Regional Committees/Councils (or networks as called in other regions) will work on regional policy and planning issues as far as agricultural machinery is concerned under the guidance and with the participation of the national ministries concerned for regional development institutions like ECOWAS, SADDAC, etc.

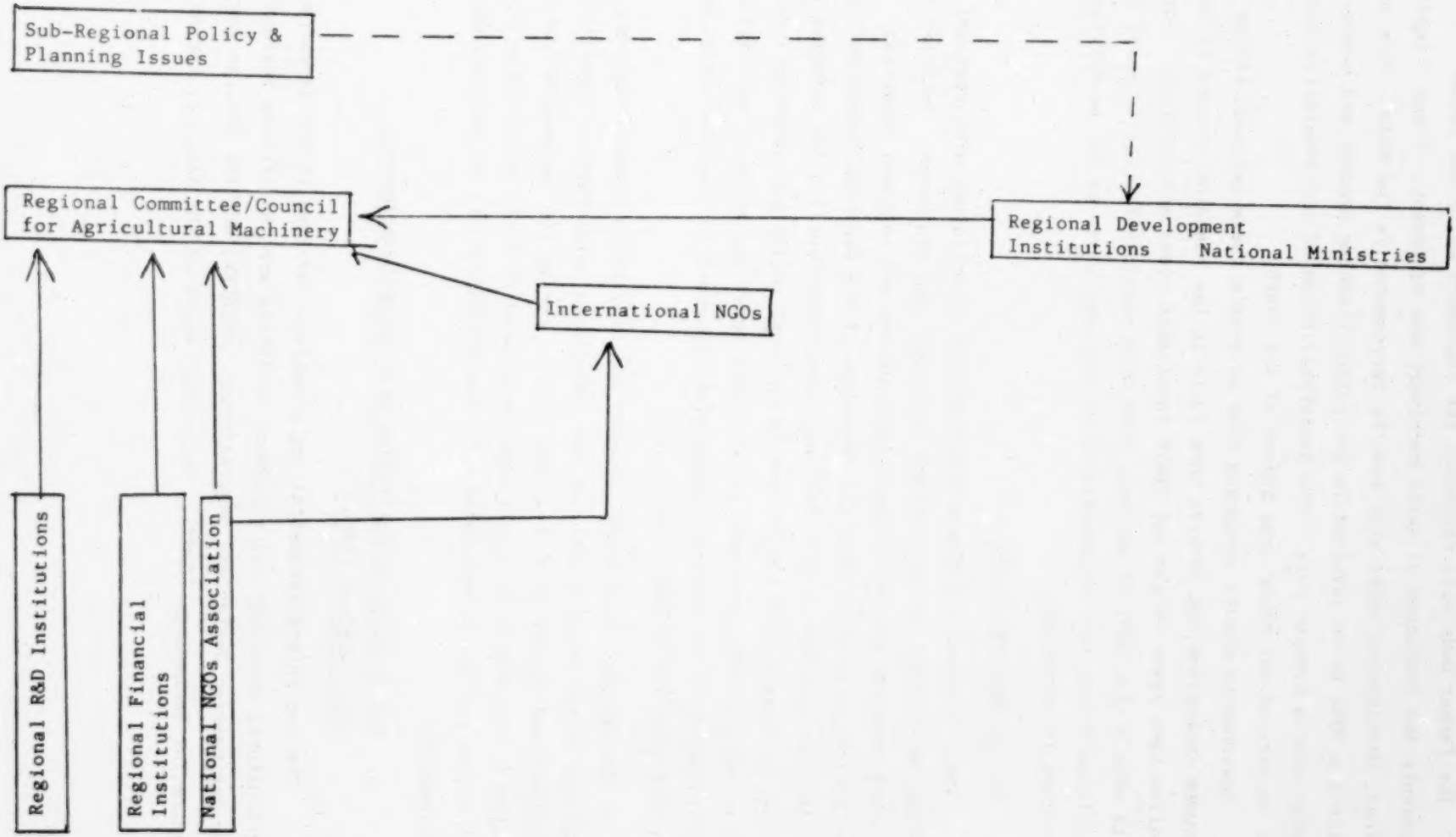
The Regional Committees, primary aim will be to promote regional projects with the objective of organising the integrated development of agricultural machinery and equipment at regional level. During the implementation phases of projects, regional NGOs should also be allowed to fully participate in planned activities and may be entrusted with the responsibility of carrying out concrete assignments.

3. Coordination of Activities with Inter-Governmental Organisations (IGOs)

The two intergovernmental organisations involved in the development of agricultural machinery and equipment in Africa are the African Regional Centre for Engineering Design and Manufacturing (ARCEDEM) and the African Regional Centre for Technology (ARCT). While ARCT works in the field of technology, i.e.

Table 5

Proposed Institutional Interlinkage with Regional NGOs for the Development of Agricultural Machinery



through the promotion of local technology and introduction/dissemination of adaptable frontier technology, ARCEDEM is entrusted with the responsibility of developing capabilities in machine design and manufacture, beginning with such priority areas as agricultural machinery and equipment.

The two institutions should promote cooperation with national associations of NGOs and assist through the supply of designs, dissemination of information, training, promotion of manufacture of accepted equipment, upgradation of workshops and promotion of entrepreneurs.

4. The Role of UNIDO

a. As explained above, NGOs at national level are in some countries fairly involved in the development of agricultural machinery, mainly through cooperatives or associations, e.g. COBEMAG in Benin, ARCOMA in Burkina Faso, and many others. It is suggested that UNIDO organise the assessment of this arrangement in order to liquidate the bottlenecks and promote this national networks in other countries where they do not exist.

b. UNIDO could also, in the selected countries, organise networks of small-scale industries at national level patronised by national associations of non-governmental organisations. This of course in the framework of an integrated national policy. In fact, countries like Nigeria and Ghana possess many of these small-scale industries. But lack of organised national structures is leading them to duplication and unnecessary competition on some equipment while others are ignored.

c. In the spirit of sub-regional integration, UNIDO should promote networks of agricultural machinery manufacture and in this process ascertain the full participation of NGOs both in the planning and implementation phases.

d. UNIDO should organise sub-regional meetings of NGOs involved in the manufacture and development of agricultural machinery in order to discuss specific problems facing those institutions and define potentials to be developed in order to stimulate and facilitate their participation in the overall process.

e. International Expert Group Meetings of NGOs from all regions will certainly help Africa to gain experience from the approaches adopted elsewhere. The impact of these meetings will be more felt if the meetings are specialized, for instance

- meeting of experts on animal-draw implements manufacture,
- meeting on post harvest processing equipment manufacture,
- meeting on hand tools manufacture, etc.

International NGOs could play a big role in such activities. It is suggested that UNIDO plans and organises these meetings, as well as work out specifically the role of well established international NGOs in the development of agricultural machinery and equipment in Africa.

BIBLIOGRAPHY

1. Agricultural machinery and rural equipment in Africa, A new approach to a growing crisis. UNIDO IS 377
2. Agricultural machinery and implements in Kenya ID/WG/418/8 E
3. Agricultural machinery and implements in Tanzania 27 pages ID/WG.418/7 E
4. Strengthening South-South business ties on agricultural machinery and rural energy. ID/WG/418.1 E
5. A survey of emperical studies in industrial manufacturing activities in the informal sector in the developing countries. 267 pages. UNIDO/IS.470 E
6. Report of the 7th Meeting of African Ministers of Industry. ID/CONF.5/28
7. A Programme for IDDA. ID/287
8. First and Second Consultation on the agricultural machinery industry; 45 pages. ID/307 E
9. Workshop on design and development of agricultural equipment in Africa. 28 pages, UNIDO/PC 55
10. Executive Director's Report 1983
11. A Programme for the IDDA ID/287
12. The IDDA Programme: review of progress, proposals and means to attain its objectives.
13. Handbook of industrial statistics 412 pages ID/284
14. Role of external assistance in African technological development: possibilities and limitations. ID/WG.332/8
15. Agriculture toward 2000 F.A.O.
16. Industrial Trade Statistics Almanach (N.Y.)
17. Lagos Plan of Action.

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THE INVOLVEMENT OF NGOS IN THE DEVELOPMENT OF FOOD-PROCESSING AND AGRO-INDUSTRIES IN AFRICA**

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* Organized by the United Nations Industrial Development Organization (UNIDO) in co-operation with the Association for African Development Finance Institutions (AADFI).

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1.0 INTRODUCTION

Agrobased industries interact with the food chain which ranges from agricultural production, processing to distribution and marketing; along with related subunits such as storage, transport, socioeconomic aspects and institutional infrastructure.

This paper provides an overall assessment of the development of agro-industry in Africa with emphasis on the food-processing industry. It aims at identifying the sub-sectors and areas in need of cooperation particularly from Africa and international nongovernmental organizations (NGOs). It covers recent growth of the agroindustry; present status and involvement of NGOs focusing on causes affecting development, problems and constraints; priority areas for development and activities of NGOs and their specific setbacks. Also considered are environmental aspects and development of human resources. Interinstitutional cooperation is essential in adequate integrated development of the agroindustrial sector, so special attention is given to this notion. Recommendations covering the major aspects of agro-industries, to enchance development through integration and cooperation between relevant institutions especially NGOs are given in the texts as the topic develops.

Serious consideration of integrated agro-industrial development is timely to combat the big food problem facing Africa now mainly due to drought in the Sahel zone in West Africa, Ethiopia, Sudan, parts of Eastern and Southern Africa (1). Thousands of people have died or are starving. The drought has brought about unexpected food scarcity, untold misery, economical hardships and severe malnutrition especially among vulnerable groups of the population. The 1974 Sahel drought claimed over 300,000 lives, while higher numbers have been reported for Ethiopia in 1984 (2). The drought has caused much migration of people and animals in search of food. Most of these perished enroute and those who made it have created a big refugee problem especially in the Sudan and the SADDC countries. Worst hit was Mozambique with 100,000 reported drought related deaths.

The situation is worsened by the rapid growth of the agricultural population averaging 2.6% per annum over most of developing Africa countries (3). The seriousness of the situation requires mobilization of all available resources, hence the need to integrate rellevant operations of government and nongovernmental organizations. The term NGO represents a broad, varied and somewhat confused universe (4). For the purpose of this paper, the term denotes organizations which are different from the state apparatus, are often organized voluntarily and endeavour to achieve various goals.

Such organizations include agricultural production and food industry organizations, chambers of commerce and industry, cooperatives and small and medium scale organizations; Research and Development (R&D) Institutes and Universities. In some countries, even financial institutions which are not state run such as banks, are included.

2.0 BACKGROUND INFORMATION

A brief analysis of the agro-industry in Africa (developing) indicates that it is characterised by a food production subsector which lags behing population growth, while processing especially in rural areas is dominated by traditional technologies. Relevant processing establishements have not integrated well, while emphasis has been placed on cash crops rather than cereals, fruit and vegetables. This section explores the growth of the agroindustry in Developing African Countries.

According to the World Bank Development Report (1982) the GDP dropped from 3.8% in 1960-73 to a low 0.4% in 1980, but rose to only 2% in 1981 for most low income African countries (5). According to the same report projection up to 1990 indicates a negative change of GNP per capita of 0.1%.

Growth of agricultural and food output in developing African countries is given in Table 1.

Table 1: Growth of Agricultural and Food Output in Africa Developping Countries (%)

Agricultural Output				Food Output			
Total		Per capita		Total		Per capita	
1960-70	70-80	60-70	70-80	60-70	70-80	60-70	70-80
2.1	1.3	0.2	1.4	2.6	1.6	0.1	-1.1

Source: World Development Report 1982.
Washington DC. Table 5.1

From table one agricultural output showed a decline from 2.7 - 9.0 to 1.3% from 1960-1970 to 1970-1980 respectively, lagging behind population growth which averaged about 2.6% (3). Similarly food output per capita declined from 2.6% to -1.1% from 1960 to 1980, implying a big food deficit.

The yearbook of Inudstrial Statistics (6) indicates that the food processing industry in African developing countries was dominated by cereal processing producing 11.2 million tons of products in 1980. Sugar and sugar products ranked second with 6.3 milion tons, followed by animal products and fruit and vegetables.

The overall average growth rates of real manufacturing value added originating from the food processing and beverages sectors in developing African countries dropped from 5.9% to 0.2% from 1965 to 1975. Beverages rose from 6.7 to 10.8% and total manufacture fell from 7.5 to 5.1% according to the limited available data. Up to 1981 manufacturing growth rates in low income African developing countries had registered little or no improvement in agro-industrial growth (7).

Between 1970 and 1980, agroindustrial structural changes in developing countreis varied according to country and commodity items. Overall, the food processing sector was much higher than beverages. Countries which registered small to moderate increments in food and beverage processing were Algeria, Kenya, Morocco, Mozambique, Senegal Malawi and Sudan. In most of the other countries growth rates of agroindustrial manufacture value added declined (7). According to the UNIDO data base (8) the number of establishments in the food processing and beverages industries in African developing countries between 1970 and 1980, was not adequately documented. The data is incomplete but shows the total number of establishments in food processing were about 6000 units (limited data) in 1970, but had decreased in some countries by 1980 due to closures brought about by various reasons.

Employment in the food processing and beverages industrial sector stood at 321 thousand and 52 thousand respectively by 1970 for all African Development countries. The figures are small in comparison with other industries, so there is much room for development. Up to 1980, changes were not uniform but the overall growth was small.

Production of raw materials Crops and livestock in developing market economy countries are summarized in Tables 2 and 3.

Table 2: Production of Major Food Crops in Developing Economy African Countries (Million Metric Tons).

	1974 - 76	1981	1982
Cereals (Total)	46.7	48.2	49.7
Wheat	5.1	4.5	5.3
Rice Paddy	5.5	6.3	6.5
Sorghum	7.6	8.3	8.4
Millet	8.4	9.3	9.4
Maize	14.9	14.8	14.2
Pulses (Total)	4.8	4.9	5.2
Roots & Tubers	74.7	81.7	84.1
Vegetables & Melon (Total)	0.5	0.4	0.3
Sugar cane	26.8	36.4	39.1

Source: FAO Production Year Book Vol. 36 - 1982. Crops Tables (FAO 1983).

From Table 2, it is evident that cereal (total) production only increased by 6% between 1974-76 and 1982. Wheat, rice, sorghum and millets all increased but maize declined. Roots and tubers registered the highest in terms of wet weight production and also increased substantially over the period.

Table 3: Summary of Livestock Numbers (African Developing Market Economies) - Million head

	Cattle	Pigs	Sheep	Goats	Chickens
1974 - 76	126.2	6.9	114.0	116.9	394.0
1981	137.6	8.6	126.6	128.3	502.8
1982	139.4	9.0	128.6	130.6	525.7

Source: FAO Production Year Book Vol. 36 - 1982. Livestock Tables. (FAO 1983)

From Table 3: over the period, the cattle population increased by 11%, pigs by 30%, sheep by 13%, goats by 12% and chicken by 33%.

This trend indicates an over all increase in livestock based raw material supply.

2.1 Non-Governmental Organizations (NGOs)

Non-governmental organizations (NGOs) by formal definition are rather poorly developed in African developing countries compared to other continents (9). The history of NGOs in Africa is also not well documented but varies much. The strongest NGOs are those which grew from traditonal community organizations and selfhelp groups which form the backbone of African brotherhood and extended family cooperation. Often the communities live in villages and own land around which agro - industrial operations such as production, storagle, traditional processing, marketing and distribution are organized. In the case of Tanzania, these groups have been officially recognized to form the base of the Ujamaa Villages which accommodate about 80% of the total population.

Church-based NGOs evolved from preindependence days whereby European and American churches started establishements and societies to provide for the material well being of their followers. Presently in Africa, many such NGOs are based around various churches and denominations. Most are indigenous and indipendent of the mother churches, but some are still organized from abroad.

African NGOs linked to overseas voluntary organizations (nondenominational) were often started as offshoots of international voluntary organizations. The most prominent, existing practically in all African countries are the National Freedom from Hunger Committees/Action for Development (FFHC/AD). These groups are heavily engaged in food production and income generating operations to stave off hunger.

In some African countries there exists NGOs which are sponsored by national governments. As big success is the cooperative movement dealing with all aspects of agro industries in Africa, for example production sprocessing and marketing of cash crops like coffee and cotton in Tanzania.

In retrospect, the limited information available, indicates that African NGOs involved in agroindustrial operations have succeeded in intervening where need was felt most, creating awareness among communities and mobilizing resources for development against really tough odds.

In most African countries universities are not strictly NGOs but they enjoy some amount of independence from the central government machinery. They play a leading role in training personel for agro-industries and relevant Research and Development institutes. Most developing countries have at least a university or university college.

The following selected countries have university institutions which give agricultural training or food and nutrition. The list also includes research organizations specializing in agroindustries.

Table 4. Countries with Agro-Industrial Universities and Reserch Institutions.

Country	No. of Institutions
Algeria	3
Benin	1
Chad	1
Congo (Brazaville)	1
Egypt	4
Gabon	1
Ghana	2
Guinea	1
Ivory Coast	1
Kenya	2
Mali	2
Nigeria	4
Senegal	3
Sudan	3
Tunisia	3
Zambia	1
Zimbabwe	1
Tanzania	4
Uganda	1

Source: - UNIDO (1982) - "Information sources on Grain Processing and Storage". UNIDO. Vienna.

Another active group of NGOs is made up of national chambers of commerce and industry. These have t cities in almost all African countries. They concentrate on industrial processing, marketing and distribution and play a leading role in agro-industries.

Food industry organizations are not very common but Food Science and Technology associations have been formed in Kenya, Nigeria, Ghana and Egypt. The Food Manufacturers Association in Tanzania

also serves the same purpose in food industry development (10.11)

The rotary club international has members in most African developing countries. Their activities are many and varied and include support to many small projects and activities related to agro-industries.

3.0 PRESENT STATUS AND INVOLVEMENT OF NGOs

3.1.0 Major Causes Effecting the Development of Agro-industry, Particularly Food Processing Industries.

Causes affecting agro-industry development could be grouped into internal and external causes. Some are of a political nature and others are agriculturally allied or human resource based.

3.1.1 Causes of Political Nature

The analysis presented here is based on experiences from Ethiopia, Kenya, Ghana, Nigeria, Senegal, Siera Leone, Zimbabwe, Angola, Uganda and Tanzania. These countries could be regarded as representative of most African developing countries (12).

3.1.2 The degree of political maturity

Political maturity and ability to lay sound policies, create stability and inspire confidence are important factors. Some of the recently independent states are in a state of transition, plagued with instability, coups and inadequate development strategy. Internal strife as reported in Ethiopia, Uganda, Chad, Sudan, Mozambique and Angola, among others, affect the food system including processing, and manpower.

3.1.3 General Policies and Food and Nutrition Policies as laid down by national governments affect the pattern of agro-industries. Pre-independence agricuiltural patterns with emphasis on cash crops to supply mainly overseas markets still dominate, and this adversely affect African agroindustrial growth, related to staple foods.

3.1.4 National Plans and Development Strategy.

Most African Countries have annual and Five Year Development Plans which dictate the course of action. These plans determine the degree of self sufficiency, growth in different sectors, investment deployment and degree of integration in different programmes and projects.

3.1.5 Food and Agriculture Related Causes.

National food and agricultural policies determine the pattern of agricultural products which provide raw materials and the base for agroindustry development. Agronomic and postharvest status especially storage, processing and marketing patterns are

important subunits. Pricing policies often determine producers incentive and often influence production and marketing at both local and international level.

3.1.6 Causes Related to Processing

The supply and quality of raw materials affect capacity utilization of installed plants, implying the need to match processing needs to agricultural production.

The degree of technology advance and capability in African Developing Countries largely influence agroindustry growth. Presently, the sector depends heavily on imported technology, which is very expensive and under patent controls. The low level of indigenous technology and ability to fabricate processing equipment using locally available resources even under license, undermines efforts to develop agroindustries in African Developing Countries. The above mentioned coupled with the level of back-up services provided by local and overseas firms and institutions, along with the state of Research and Development Capability and utilization, strongly influence agroindustrial growth.

Naturally, the development level of the marketing and distribution sector which provides an outlet for processed goods, is a very important subsector in agro-industrial development.

3.1.7 Manpower, Management and Administrative adequacy are important factors Self sufficiency in skilled manpower in the food processing industry, the level of on the job traininy or apprenticeship, proper allocation and utilization of manpower; management and administration of human resources, all influence development.

3.1.8 Finance and Investment.

Finance and investment capability and potential are the core of any agroindustry for it affects all subsystems from production to consumption. Here government and non governmental resource deployment are vital instruments for integrated development.

3.1.9 External Causes

These are many but the major ones influencing the growth of integrated agro-industries are related to trade, multinational corporations and monopoly of advanced technology.

Tariffs limit access to markets outside developing countries since the tarrifs in developed countries are high and terms and conditions set, are biased towards strangling development in young developing countries. Closely allied to this are the international pricing policies which do not favour developing African countries as exemplified by cocoa, cofee and cotton which have been experiencing severe price fluctuations

Transnational corporations operating in Africa concentrating on staples for local use, cash crops, and exotic export crops such as fruits and vegetables (13) have the high level of technology, manpower, management skills and financial capability to affect the development of agroindustry in Africa. They are also highly involved in cereal milling, bakery products, vegetable oils and livestock products, all of which affect the core of the nutritional status of indigenous popuations. These corporations along with overseas government and nongovernmental institutions have the financial and technological capability that could strongly influence the growth and direction of agroindustries in Africa.

3.2.0 GENERAL STATUS OF FOOD INDUSTRIAL PLANTS IN AFRICA

This section concentrates on the major types of plants installed, main problems being confronted, utilization of plants capacities and plants in need of rehabilitation.

The major types of plants in use in Africa, follows the pattern of agricultural production. Cereal milling equipment dominates, followed by vegetable oil extraction, fruit and vegetable processing machinery, animal products processing and beverage manufacture.

3.2.1 Problems

Plants in use in most African developing countries face many problems which would not easily occur in developed countries. Some of the equipment was installed during preindependence days and due to the recent and current poor state of the economy, they have not been replaced by current advanced plants that have since been developed in stride with advances made in technology else where in the world. The equipment in use is therefore obsolete in most plants that are in operation.

By the same argument it is obvious that the techniques, and handling of materials in use in most plants is outdated and rife with ineffeciency and low output. For example oil extraction by the old expeller would hardly compare with modern solvent extraction technology.

The supply of spare parts maintenance and backup services are vital aspects in any plant, but in the case of the African situation, where obsolete equipment is in use, these aspects are lacking or are minimal. Since the equipment is so old, the original manufactures have either wound up or have just stopped producing old models in favour of modern, more advanced and efficient plants.

In some cases, even where the spares and backup services are available, the economic recession existing now and availability of resources in the form of foreign exchange, make foreign purchases

virtually impossible. As a result plants just limp along with whatever is possible. The absence of adequate local fabrication facilities for spares parts in most African countries makes the situation worse.

Most plants in existance especially the older ones are run and managed by personnel that could do with better training and skills. As a result handling, servicing and output tend to be poor.

3.2.2 Utilization Percentage of Plant Capacities

Data on capacity installed and utilization in African developing countries is very scantly so only a sketchy description is given here. The level of capacity and utilization are affected by many technical and economic factors. Technically, the unit operations involved, and their operational capacity and effeciency determine the overall performance. On the other hand, economic factors such as supply and demand, prices and world trade trends affect total production to satisfy consumers. It is correctly reported that capacity utilization in developing countries is much lower than developed ones (14).

Tne vegetable oil and fats industry is quoted to indicate the seriousness of the situation and it could also be assumed that the situation is not very different in most other plants in operation (15). It is estimated that capacity utilizatilization in the vegetable oils and fats industry in Africa average 32% while for developed countries it ranges between 65% - 85%.

Differences among developing African countries were wide in surplus and deficit areas. In surplus countries, in 1982 crushing capacity utilization varied from 15% for Zaire, 27% for the Ivory Coast 38% for Senegal and 62% for the Sudan. In deficit areas, Niger had 18% Tanzania 21% while Morocco used 70% of her crushing capacity. It would appear that lack of proper integration between existing crushing plants and the raw material production on one hand and between domestic and export markets on the other was a major cause.

3.2.3 Plants in Need of Rehabilitation

From the afore mentioned, it would appear that the existing plants in the food processing sector from cereal milling, animal products as well as fruit and vegetable processing require rehabilitation, complete overhaul or full replacement with modern plants so as to increase capacity utilization. This step would raise output and yield numerous economic returns.

3.3.0 PRIORITY FOOD PROCESSING INDUSTRIES IN AFRICA

This section deals with food industries which should be given priority, their potential and limitations. Priority consideration is based on industries where the greatest potential for success exists, such as those which could use locally available raw

materials and could engage a good number of human resources in its integrated development.

Another consideration is that the priority industry should address existing problems such as insufficient food and malnutrition as well as rural and urban needs. Proper integration into existing infrasturcture for overall development is also very important especially where output might yield economic returns, local and foreign exchange. Bearing the above mentioned facts in mind, the following industries are considered as priority ones:

3.3.1 Cereal Processing

The majority of the African population subsists on cereals such as maize, rice and wheat. In dry areas prone to drought as is the current situation, sorghum and millets are the life saving food grains, the only hope for millions in the Sahel Zone and parts of Eastern and Southern Africa.

The coarse grains mainly maize, sorghum and millets are usually milled whole or decorticated into flour or grits, but unlike wheat, a variety of flour products are not produced. The technologies in use especially in rural areas which harbour 80 - 90% of the total population are largely traditional using the old mortar and pestle or grinding stone. Recently fuel or electricity powered mills have been introduced to reduce the druggery of grain processing which is mainly done by women. In urban centres roller mills for wheat and hammer mills are in existance, often run by National Milling Corporations as is the case in Ethiopia, Kenya, Uganda and Tanzania, mainly to cater for the urban population.

The flour is usually eaten as porridge and in the case of wheat made into a variety of bakery products. This sector integrates well in that the by products are made into animal feeds and the bran could produce oil.

Cereal Processing has a high potential. The production of raw materials is virtually guaranteed for it forms the bulk of agricultural activity. The average yields per hectare are currently relatively low but there is ample room to raise yields through improved crop husbandry and better seed. There is ample arable land which is currently under utilized and since the continent is endowed with much fresh water in lakes and rivers, the potential for irrigation is very high as demonstrated by the large irrigation schemes in the Sudan and Egypt.

The processing technology and plants for most cereals is well known and the machines are easy to run and maintain. There is a big ready market in rural and urban areas as the population is growing. The potential for major types of convenience foods such as bakery products like bread, cakes, flakes and chapatis is yet to be fully tapped.

However there are some limitations which can be surmounted. Pests limits crop production over most of Africa, while drought has persisted over the last decade severely curtailing cereal stocks and causing famine. The Quelaequelae birds are a plegue to cereal grains over most of Africa.

In the case of sourghums and millets, the milling technology for other cereals is inadequat for medium and large scale processing because of the biological nature of the grain. However, abrasive milling as developed by the International Development Research Centre (IDRC) of Canada or adapted rice dehullers offer promise as already demonstrated in Botswana, the Sudan and Tanzania (16).

3.3.2 Root Crops

Root crops such as sweet potatoes yams and cassava flourish over most of tropical Africa. Cassava has the added advantage of being drought resistant. Production is high and nutritionally it yields the highest calories per hectare compared to other foods. The production arguments advanced for cereals apply here equally well.

Cassava is taken as a model here and bearing in mind what the white potato has achieved in developed countries, cassava has a very big potential in Africa where it has sustained the life of millions for years. Good high yielding varieties have been developed and even high protein varieties exist. The plant is versatile for a variety of uses. Apart from the roots, the leaves are used as a vegetable high in protein, vitamins and minerals. Cassava roots store well in the ground and surpluses in rural areas are shared with livestock indicating its high potential for integration.

A wide range of traditional technologies for processing exist and a variety of products such as flour and fermented products are widely consumed. These just require scaling up through development using available modern techniques and equipment which are already available (17).

However, cassava is limited by the presence of cyanide in some varieties both in the root and the leaf. There are techniques for inactivating the cyanide anyway, even in traditional processing and fermentation. The roots handle poorly and have a limited shelf life.

3.3.3 Vegetable Oils and Fats

A wide variety of oil seed crops are produced all over Africa as the climate is ideal. They all produce oil which is a rich nutritonal, energy source and has wide demand and ready markets locally and overseas. The byproducts such as the seed cake has a wide range in baby food manufacture, protein extraction and animal feed manufacture. The vegetable oil industry therefore has a big potential for integration.

It would appear that cotton seed production has a big potential as the industry is already established from production to processing. However the presence of gossypal in some varieties is a limiting factor but this has already been tackled by the introduction of glandless, gossypal free varieties.

Groundnut production is well established in West Africa with more room for expansion. It yields high quality oil and excellent cake, but the development of the toxin, afflatoxin under high moisture conditions poses some limitation which can also be overcome by careful handling or heat treatment.

Palm oil production is well established in West Africa and is slowly gaining ground in East Africa. Coconuts flourish well along or near the tropical coast. Other oil sources include sybeans, sunflower and simsim all of which do well over tropical Africa. They have a high potential in the agricultural sector, are highly labour intensive and would integrate well in rural industrial complexes.

These oil plants are limited by agronomic factors under subsistance production but these could also be overcome. Since they are labour intensive where migration from the country to towns has already occured, the supply of labour could be a limiting factor.

3.3.4 Fruits and Vegetables

Fruit and vegetable production in Africa is possible all over, where the climate is suitable. A wide variety of these crops expecially choice quality exotic fruits and citrus types do wel as exemplified by plantations in south and north Africa.

The vast forest areas that cover tropical Africa are all potential areas for plantation fruits and vegetables and this belt is yet to be developed substantially. There is a big demand for these crops, the local and export markets are yet to be fully exploited. The technology and plants for processing these at grass root level and industry exists and are readily available. This sector offers much room for intensive labour for providing income as well as integration into by products processing and uses.

Some limits exist now. The production of raw materials is hardly linked to processing needs and capability so this aspect require priority consideration during integrated development. The crops are often highly perishable and require quick handling and processing. The situation is worsened by poor transport infrastructure, the need for cold storage handling and inadequate marketing and distribution network.

3.3.5 Animal Products Industry

This sector covers livestock products such as meat, milk and milk products, poultry and fish. Africa is endowed with a big

population of cattle, sheep, goats, pigs and poultry, while her waters abound with much fish. The potential for developing this sector is very high in that there is ample land, rivers and lakes, while improved breeds developed in collaboration with developed countries are already available, just awaiting wider use especially in rural areas.

However serious limitations which exist must be overcome. Deseases and health care leave much to be desired. Tsetse flies infest most of Tropical Africa, severely limiting areas for livestock production. The supply of animal feeds is limited and severely curtail the performance of improved breeds. Animal products are highly perishable and like fruits and vegetable, require cold storage facilities, rapid handling and distribution.

3.3.6 Animal Feeds Production

From the afore mentioned, integration with the other crop sectors necessitates the production of animal feeds. The demand and markets exist, but in a continent prone to hunger and famine, the competition between man and animal must be kept to a minimum, in favour of human beings especially in cereals. The current high animal population with limited supply of feeds other than grass, creates a ready outlet for animal feeds.

However adverse weather conditions leading to drought, pose a limitation to raw material production. High transport costs from the farm to the processing facility and back to the farm raise the final price to the consumer. The supply of imported inputs such as vitamins, minerals and medicines is another limitation since these are often imported using foreign exchange which is often meagre.

3.4.0. MAJOR ACTIVITIES UNDERTAKEN BY AFRICAN AND NON-AFRICAN NGOs IN SUPPORT OF AGRO-INDUSTRIES (INCLUDING FOOD PROCESSING).

Most NGOs, African and non-African, concentrate on three sectors namely:- rural life improvement (mainly agricultural subsistance crops for cash and food); education (children and adults) and health (nutrition and medicare) (18). These activities integrate well with the development of a healthy agro-industrial sector.

Rural life improvement involves NGOs in social mobilization of the community which often includes creation of awareness of social rights, economic potential, use of locally available resources and infrastructure, problem definition and participation in drawing up strateges for solutions. As a result, often NGOs provide a link between the community and government.

3.4.1 Production and Utilization of Materials for Agro-industries

Agricultural production which is the backbone for rural life and the base for agro-industries, embodies much activity by local and foreign NGOs. This is illustrated by projects undertaken by the Freedom From Hunger Committees/Action for Developmnt in many African countries, coordinated from FAO in Rome. These include some production of cash crops and food crops like cereals, legumes, fruits and vegetables under irrigation. Raising small stock such as poultry, rabbits, pigs and goats and promotion of improved high grade livestock are favoured projects.

The Heifer Project International based in the USA has played a major role in supplying high grade heifers to many African countries which have in turn helped their fellow developing countries.

The cooperative movement in Africa plays a leading role in agro-industries. Most cooperatives are supported by national governments: are involved in procuring credits for their members and safe guard property such as land. They also act as channels for aid to their members.

A close look at African agro-industrial cooperatives shows that they are organized mainly around cash crop as cotton, coffee and cocoa. They are actively engaged in production aspects, storage and processing such as oil extraction, ground and instant coffee and cocoa. Often they do their own marketing and distribution in local and overseas markets. These cooperatives have registered much success in Eastern and Western African countries. However consumer cooperatives handling the provision of essential commodities such as food and clothing for local consumption have not been as successful especially in the post independence era, since these items hardly serve the interests of overseas markets in developed countries.

3.4.2 Aid

Overseas NGOs such as FFHC/AD committees, aid organizations and church groups in developed countries have ample financial resources which are given to the poor of the third world. Scrutiny of such aid indicates that food aid especially in times of disasters like drought and floods dominates. At times such aid stifles local efforts towards self sufficiency and leads to more dependence on foreign help. Often foreign NGOs finance projects which involve agricultural production, storage, processing and consumption and in the process provide short term project management expertise and evaluation. However, more often than not, the support stops as soon as the funds run out, leaving projects unfinished and in suspense in the hands of inadequately equipped local NGOs. In the meantime, aid is hardly neutral so it tends to create dependence and community resented pressure.

NGOs in general link local communities to their overseas financiers and where differences occur, tension builds up all round especially where senstive aid projects fail to live up to expectations after evaluation often demanded by financing NGOs.

3.4.3 Consumer Protection

NGOs sometimes participate in protecting consumers by their involvement in improvement of the quality of life especially in rural areas. Support of fair prices for producers of agricultural raw materials and inputs as well as finished agro-industrial goods such as food, directly stimulate the development of the sector.

3.4.4 Promotion of Technology

Technology utilization and advance are vital in agroindustrial development and both African and non-African NGOs are actively involved. In general in the food processing industry, food industry organizations such as national assiciations of science and technology, chambers of commerce and industry, cooperatives; often link up with research and development institutes and universities with agroindustrial departments to explore and develop new technologies which are then extended and promoted to the relevant users.

Promotion of Intermediate Technology or Appropriate Technology from North NGOs has been successful as reported by the Intermediate Technology Development Group (ITDG) based in London (20). ITDG has not only helped to develop working projects and technologies for rural areas in fields ranging from cheap energy sources to transportation, from water supply to food production, storage and processing; it has also been a guiding star for the appropriate technology movement which numbers more than 1000 groups and units, some of which are NGOs in developing African countries.

3.4.5 Training and Research

African and non-African NGOs play a big role in training and

research related to agro-industrial development. The low level of education and agro-industrial skill in most of rural Africa, provide a ready recepient of advanced education and technological skills from North NGOs which are richly endowed. Major activities involve on the job training in various fields by experienced project expatriate personnel, granting fellowships to study abroad and building local training capability by providing trainers and infrasture.

Universities play a vital role as they have the potential material, human and financial resources and facilities for training and research in agro-industry. However in some African countries, universities are not strictly NGOs as they are sometimes part of the government infrastructure. More often than not, they face highly qualified manpower and the latest technological facilities.

3.4.6 Financig:

Financial NGOs actively engage in project planning, feasibility and implementation, provide credits and loans especially to African NGOs and agroindustrial areas tend to receive priority as they serve community needs and are likely to succeed.

3.5.0 MAIN PROBLEMS AND CONTRAINTS FACED BY NGOs

The general problems and constraints outlined earlier in this paper in the causes affecting the agro-industrial sector in Africa, apply equally to NGOs, so there is no need to reiterate those here. This section therefore concentrates on those which prevent the NGOs from becoming more active in this sector.

3.5.1 Low Success Rates and Frustration occur in some NGOs basically due to the nature of projects involved i.e. those aimed at tackling rural poverty. This field has many parameters and many of the aspects are beyond the control of NGOs, the community and even government.

3.5.2 Cooperatives

Cooperatives face problems and constraints mainly due to the way some were founded, under pressure in pre-independence days to cater for the interests of developed countries often with the encouragement of uninternational agencies which considered such societies as an excellent tool for liberating the less developed countries (19). Cooperatives were therefore formed at random, grouped together lukewarm members who were unconvinced of some of the activities inspite of artificial financial and material support from various interested parties.

Activities such as emphasis on cash crops, do not really answer the needs of the local people which revolve around food, shelter and clothing, so they are often treated half heartedly. The rural poor feel exploited in that returns from heavy toil are low due to low world market commodity prices, heavy government taxation and

syphoning of heavy profits by middlemen and suppliers of finished processed products such as food and clothing items.

At the local level, some cooperatives, though rich, have been run under poor management and even have involved financial misappropriation to the consternation of members.

3.5.3 Limited Resources

African NGOs especially those founded on traditional community norms have poor material, human (trained) and financial resources. Their dependence on foreign or government support at times limits their activities.

3.5.4 Poor Project Preparation and Management

Projects in agroindustry require adequate preparation and management so as to achieve growth and integration into the whole system. These skills are limited in most African NGOs, so activities are adversely affected.

3.5.5 Political Pressure

African politics are still in a state of transition and politics at grassroot level involve traditional and modern government approaches, which are not always compatible. At times, influence from outside the NGOs conflict with their own interests and those of the community. A stable political situation along with acceptable village and national government policies and guidelines are essential for successful integrated growth of agro-industries.

3.5.6 Suspecion by Governments

NGOs with foreign links (which form the majority in Africa) are at times, suspect by national governments as they tend to introduce alien ideology and influence. This may be more pronounced in socialist oriented regemes, tryiny to get away from capitalist domination. A situation like this will inevitably cause some mutual resentment and limit activities undertaken.

The nature of the link up is usually the Community - NGOs - Foreign Funding agencies; so NGOs are literally squeezed in between. The funding agency may even give the impression that it is employed by foreign powers. In some instances NGOs tend to go out of the original objective of giving technical support and engage in class struggle and political ambitions. Obviously activities such as mentioned above negatively affect the success of NGOs.

3.6.0 MAJOR AGRO INDUSTRIAL SUB-SECTORS AND AREAS OF COOPERATION AND SUPPORT BY INTERNATIONAL NGOs

The major agroindustrial subsectors and areas considered for cooperation and support are based on priorities already established elsewhere in this paper. They are based on the

premise that they tackle existing problems and answer community needs, basically food and adequate nutritional status.

3.6.1 Industrialization in General

First and foremost, developing Africa must industrialize like colleagues in developed countries who evolved from humble beginnings, but with obvious shortcuts in acquiring technology. Industrialization based on structures and techniques that are soundly conceived is necessary for developing agro-industries, technological independent economy and guaranteed financial strong position. The agroindustrial sector should be the focus of a network of integrated industrialization. International NGO's could therefore be useful at strategic points in the network identified in collaboration with the local community. The following subsectors offer potential for cooperation and support.

3.6.2 Grain Production and Processing

Cereal grains form the major staple for most African countries, so help to improve agricultural production through better inputs such as machinery, fertilizers, seeds, irrigation facilities and pesticides would go a long way towards tackling the food shortage problem. Developmnt of improved rural storage would curtail the big losses occuring in stored grain, often estimated at 20-30% and save much needed food for the population.

Processing facilities, even simple ones suitable for rural areas or small scale enterprises, such as threshers, decorticators, winnowers, grinding mills and sifters; offer much room for development of agro-industries in Africa.

Legumes are the poor man's meat and provide up to 50% of the protein requirements of some tropical African populations. Support of this subsector along the lines suggested for cereal grains especially with regard to processing to reduce cooking time and remove nutritional inihibitors, would alleviate the protein energy malnutrition probleme (PEM) which affects over 25% of preschool children in developing African countries.

3.6.3 Vegetable Oils and Fats have high potential for improvement and expansion and since oil is high in energy content, wider consumption could decrease energy malnutrition.

3.6.4 Meat

This subsector includes livestock such as cattle, goats, sheep, pigs, rabbits poultry and even wild game which is abundant in Africa and fish. Cooperation and support from production, processing to consumption would answer the needs of many African and overseas interests. This field is within the means of international NGOs.

Uther subsectors offering potential cooperation and support as

indicated in previously dealt with priorities include, fruit and vegetable production, processing and marketing. The animal feeds subsector also offers some promise.

3.6.5 Areas of Coopration and Support

Generally all systems and subsystems in the agroindustrial complex if well integrated offer scope for cooperation or support. The following are priority areas.

3.6.6 Technology Transfer

Technology transfer should answer the needs of the community. It should be appropriate in that it is locally accepted, adaptable and within local resources for sustainance. Logically it should address major constraints from production, processing, to marketing and distribution. Where equipment is concerned, creation of research and development capability to develop and upgrade local technologies, fabrication of machines at local level and manufacture of spare parts, all offer rich ground for cooperation. Since integration is so desirable it would be tempting for foreign NGOs to set up demonstration model units in selected countries for "pilot" training and nucleus for further development.

3.6.7 Training

Literacy rates in rural African countries are low, so for effective technological advance in agroindustries, adult education is a prime factor for development. Functional literacy would be highly desirable. This as well as formal education should address the whole system from production to consumption. Non African NGOs could therefore help training in local environments for better results. Sandwith courses involving LDCs and DCs or fellowships in overseas institutions would also help. Other forms of cooperation would be to create local capability to do training and research/development by training trainers and setting up infrastructures. Study tours in developed countries and within developing countries, exchange visits and organization of symposia and workshops could strongly be supported by international NGOs.

3.6.8 Trade

Most international NGOs cannot be regarded as serious trade partners with African NGOs but trade offers scope for cooperation and support. Foreign NGOs could exert pressure and influence in the North/South dialogue so as to secure a fair deal for the African countries. They could influence pricing policies to ensure better producer prices for African commodities in the world market. They could influence the lowering of trade barriers such as tarrifs and the quota system, thus expanding commodity markets for African countries.

3.7.0 MULTILATERAL COOPERATION BETWEEN UNIDO NGOs AND AMONG NGOs

There are many areas of cooperation between UNIDO and NGOs and between NGOs themselves especially bearing in mind the roles and

objectives as well as problems and constraints being experienced by these organizations, as already outlined in this paper.

UNIDO by the nature of its formation and objectives could cooperate in policy and guidelines formulation. Cooperation in R & D and information collection, dissemination and exchange is an obvious area. In this process UNIDO could identify problems and look for donors, while supporting the effort by relevant consultancies. Briefly UNIDO field cooperation with NGOs and within NGOs could be grouped into the following groups as they interlink.

3.7.1 Transfer of Technology

Areas relevant in the African situation have been dealt with elsewhere in this paper, so only specific aspects are dealt with here. Preparation of feasibility and preinvestment studies for the establishment of integrated food processing industry offers much room for multilateral cooperation. This would reduce the risk of selecting inappropriate technology and financial losses.

Feasibility and Pre-investment studies

This cooperation could be undertaken in the establishment of integrated food processing industries. UNIDO and north NGOs as well as more experienced developing country NGOs could offer their intellectual and technical capabilities to do detailed and objective feasibility analyses of agro-industrial undertakings. Such studies should cover production, processing through marketing and distribution as well as spin off industries in a matrix of integration. The above mentioned could be followed by project formulation and eventual implementation by African NGOs.

3.7.2 Consulting Services

Consulting services within agro-industrial development offer much room for mutual cooperation. They could be in the form of studies on organization, economic, technical, management and marketing as well as several relevant aspects of technology. Desirable services could involve engineering and general contracting for the exportation and launching of industrial turnkey and product in hand projects especially in developing country NGOs interested in integrated development of agro-industries.

3.7.3 Joint Ventures

Joint venture are highly favoured among NGOs as they cover joint production, processing and marketing for mutual benefit. UNIDO could get involved by exposing the range of available opportunities, and providing confidence and technical know how. North NGOs could be shareholders and offer financial collaboration. The establishment of pilot plants could serve as a nucleus for more development and investment by African NGOs.

3.7.4 Financial Arrangements

This could well be undertaken between NGOs with the active encouragement and support by UNIDO. Cooperatives offer a good channel for tapping this resource. In practice, UNIDO could give the certification of the technical viability of projects, while developed country NGOs could offer the elaboration required. Loans could then be given by cooperative financial institutions along with technical knowhow and guarantees in the form of export credit. The developing country NGOs could then execute the project with confidence and back up. As already mentioned, plants in many developing countries require rehabilitation. This is expensive, so capable developing country NGOs with the encouragement of UNIDO could finance such an exercise.

3.7.5 Training Arrangements

These offer welcome collaboration. The recepients could be food production and processing institutions and could contain related training espects as well as technical, financial and management fields. UNIDO could easily participate in fields within her charter and commitment to member governments. Some training could take place within national boundaries but could also include exchange programmes at the international level.

Assistance for national institutional development by UNIDO and able NGOs would go a long way towards creating local capability and a degree of self reliance.

3.8 ENVIRONMENTAL CONSIDERATIONS

Development of the agro-industrial sector from production to processing is likely to use inputs which affect the environment and capable of producing pollution if not properly handled.

The production of crops such as cereals, legumes, fruits and vegetables, and plantation crops such as coffee, tea, cocoa and sugar, to mention just a few, require, extensive and intensive use of land including clearing of forests. Proper land use to maintain soil fertility, and minimise soil erosion and desertification is of paramount importance. Proper crop rotation would obviously be a big advantage. Crop husbandry necessitates the use of herbicides in large farms with limited labour and plant protection chemicals such as pesticides. Some of these leave residues in the soil and crops and when the food stuffs are processed and eaten, some pesticides like DDT tend to accummulate in the body and cause harmful side effects. Some of the pesticides in use are toxic to man and animals and where the careless have handled them, cases of fatal poisoning have occured, though such statistics are hard to comeby.

Livestock rearing in traditional Africa is widespread and where animals are regarded as a sign of wealth and a symbol of the status quo, offtake rates are often low and overgrazing is rampant. Goats in particular are disasterous as they tend to eat up everything that grows. As a result soil erosion is threatening to extend the size of deserts on the continent where overgrazing

occurs.

The indiscriminate use of antibiotics and other animal health drugs in large scale farming is slowly affecting human health as residues in the animals tend to be passed on to humans through the meat or milk. This creates resistance to pathogens dangerous to human health.

Storage of crops often involves the use of insecticides or roodepticides so as to minimize losses. These chemicals pose a danger to the environment and humans if not properly used.

In processing foods, environmental considerations are almost commodity specific. Overall, they almost invariably produce by products and wastes which are at times discharged into the open environment or water bodies.

Often the source of power is important. Where industrial coal or oil is used for generating power, power plants belge dangerous acid fumes into the atmosphere and may create acid rain which has created much environmental damage in developed countries. Hydropower where available would alleviate the problem.

The source of water is another important consideration. Africa is rife with polluted water which requires extensive treatment to make it potable. Hygiene and sanitation which are prerequisites in food processing, need careful consideration. This coupled with potential pollution from agroindustrial plants, require careful management to avoid environmental pollution.

The atmosphere especially along the coast should be considered in the choice of equipment and machinery as corrosion poses a big problem necessitating the use of stainless steel units and antirust treatment.

The development of integrated agro-industries offers some solution to environmental preservation. For example in cereal milling, the bran could be used for oil extraction or making animal feeds instead of just dumping it away. Vegetable oil by products such as the cake could further be processed into high protein products or making livestock feeds. The husks could be burnt for fuel to generate power. The same would apply to vegetable and fruits products. These are just a few examples to illustrate the point of integrated development.

3.9.0 QUALITY AND AVAILABILITY OF HUMAN RESOURCES FOR AGRO-INDUSTRIES

The quality and availability of human resources for the agro-industry in Africa requires much improvement and training along the lines already described in this paper.

Availability of human resources is high in the form of mainly peasant farmers who form about 90% of the African rural population estimated at over 5 hundred million (3). The age distribution of the total population indicates that about 50% is below 20 years while the aged are well over 25%, thus leaving only a medium percentage for active agroindustrial undertaking especially where migration into towns by youngmen has left rural villages with children and the aged. This may pose a labour shortage where labour intensive industries are established.

Education is a good indicator of quality. Overall, the level of formal education of the African population is still very low by western standards. On te otherhand, most rural populations have rich traditional education endowed with age old skills related to their needs and environments. It is this kind of education and experience which has enable local populations to survive against odds under very challenging conditions.

In the meantime, literacy is still low, while the level of knowledge in integrated agroindustry by western standards leveas much to be desired. The deficit for the time being is offset by traditional processing of a variety of products based on local staples such as cereals, legumes and root crops. western knowhow.

3.9.1 Improvement and Training Considerations

Relevant and potential areas of cooperation and support have already been pointed out in this paper. The following are most promising in the African situation. Raising the literacy level of the population, will give more access to knowledge and technology. Adult education as functional literacy will teach practical skills that could be put into immediate use in agro-industrial development. Apprenticeships among NGOs members along with on the job training offer much scope for success. This will necessitate establishing or improving infrastructure such as training institutions and personnel. Provision of communication aids such as radios and visual aids will reach remote inaccessible rural areas and thus contribute towards agro-industrial development.

BILIOGRAPHY

1. Mosha, A.C. (1985). "Workshop on Weaning Food with special Emphasis on Dictary Bulk Problems-Key Note Address" Iringa. Tanzania (In Press).

2. Maletnlema, T.N. (1985). "The Problem of Food and Nutrition in Africa" TFNC Report No. 914. (In Press).

3. FAO (1983). "FAO Production Year Book. Vol. 36. FAO. Rome, Italy.

4. Sethi, H. (1983)" Development is not a politically neutral task." Ceres 3:19-22.

5. World Bank, (1983). "World Development Report 1982." World Bank. Washington U.S.A.

6. UNIDO, (1981). "Yearbook of Industrial Statistics 1980" Vol.II. UNIDO. Vienna.

7. UNIDO, (1985). "Handbook of Industrial Statistics 1984." UNIDO. Vienna.

8. UNIDO Data Base - Vienna.

9. Aremo, J.A. (1983). "Popular participation in rural development." Ceres 3:15-18.

10. Tanzania Food and Nutrition Centre (1979). "The Food Processing Industry in Tanzania-Food Manufacturers Workshop Proceedings." TFNC. Dar es Salaam, Tanzania.

11. Tanzania Food and Nutrition Centre (1980). "The Food Processing Industry in Tanzania. Prospects Development and Control." TFNC. Dar es Salaam, Tanzania.

12. Mosha, A.C. (1983). "Integrated Food Processing Industry Development in Africa: Constraints and Promotional Measures". UNIDO ID/WG. 404/1. 22 Sept. 1983. Consultant Report.

13. UN Centre on Transnational Corporations (1981).

"Transnational Corporations in Food and Beverage Processing." New York.

14. UNIDO (1984). "An Integrated Approach to Food Processing: Vegetable oils and fats, animal feed, meat and dairy industries." ID/WG.427/6/Add.1. UNIDO Vienna.

15. UNIDO (1984). "The Vegetable Oils and Fats Industry in Developing Countries: Outlook and Prospectives-Sectoral Studies Series No.13 vol.1. UNIDO/15.47.

16. International Crop Research Institunte for the Semi-Arid Tropic (ICRISAT) (1982). "Proceedings of the International Symposium on Sorghum Grain Quality. October 1981." Pantacheru. India.

17. UNIDO (1983). "A Factory Concept for Integrated Cassava Processing Operations- The Cassava Processing Concept" UNIDO/10.534.

18. Bottazzi, M. (1983) "The Northern Partners." Ceres. 3:26-32.

19. Baharamutsa, M. (1982). "Why do our Coopratives in Africa fail? Freedom from Hunger Committee/AD. 146 (3) 4-8. FAO. Rome.

20. McRobie, G, (1983). "We are not talking about revolution but about changing the rules" Ceres 3:33-38.

The following Documents from UNIDO were also sketchily consulted.

1. First Consultation on the Food Processing Industry. The Hague Netherlands, 9-13 Nov. 1981, ID/278.

2. Second Consultation on the Food Processing Industry with special emphasis on vegetable oils and Fats. Coperhegen; Denmark, 15-19 October 1984, ID/329.

3. Performance and Integrated Approach to Development of the vegetable oils and Fats Industry. ID/WG.427/9 (1984).

4. A Differential Approach to the Industrialization of the Agro-Sector in Developing Countries by J.C. Simon. ID/WG.427/3. (1984).

5. Problems of Development of the Dairy Industry in Developing countries. By M.R. Bachman and P. Rieder. ID/WG. 427/2. (1984).

6. The Role of Agroindustries in the Industrialization of Developing Countries. By M.M. Aref UNIDO/IOD.1 (1976).